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## CONTENTS

### EDITORIAL

**The changing relationship between doctor and patient**

Bhattacharyya NC ..... 01-02

### REVIEW PAPER

**Rationale behind using stress MRI over nuclear imaging for cardiac ischemia evaluation**

Baruah Dhiraj, Gupta Nishant, Boruah Pranjal, Shahir Kaushir ..... 03-06

**Timing of orthodontic treatment**

Roy BK, Chanu Ibemcha, Dasgupta Mahasweta ..... 07-10

**Legal and ethical issues of research and publication**

Mahanta Putul, Thakuria Das Kahua ..... 11-15

### ORIGINAL PAPER

**Study of incidence of externally visible congenital anomalies in stillbirth human fetuses of Manipuri origin**

Momin D Ambath, Debbarma Pranab, Debbarma Tanusri, Singh Th Dineshor, Saha Nirmalya, S Robert Ginlunmang Zou ..... 16-18

**The clinical profile and histological variations of medulloblastoma in North East India**

Bhuyan Mrinal, Haque Inamul ..... 19-23

**A study of serum zinc in depression**

Teli Barhai Anju, Baruah Jahnabi, Goswami Kumar Hiranya, Gupta Pratim ..... 24-27

**Prevalence and antibiogram of uropathogens in a tertiary care hospital in Manipur, India**

Devi Bishwabati Yumlembam, Laifangbam Supriya, Singh Rajkumar Manojkumar, Huidrom Smeeta, Singh Huidrom Lokhendro ..... 28-32

**A study on lymphoid follicles of appendix**

Hazarika Bornali, Deka Rup Sekhar ..... 33-36

**Dental morphological anomalies in the Adi tribe of Pasighat in Arunachal Pradesh**

Das Lima, Bhuyan AC, Kataki Rubi, Kalita Chandana ..... 37-40

**Pattern of homicide in Gurgaon region**

Chauhan Harsh, Yadav Ruchika, Mathur Deepak ..... 41-43

**Knowledge regarding assisted reproductive technology among infertile couples**

Hazarika Dreamly, Baruah Jini ..... 44-46

**Spectrum of ovarian cystic lesions: a histopathological study**

Handique Amitabh, Sonowal Basanta ..... 47-50

**Effectiveness of structured teaching programme on knowledge regarding cord blood banking among staff nurse**

Narang Sumpi, Dutta Arunjoyoti ..... 51-54

**Gender prediction: anthropometric study of mastoid process and foramen magnum**

Srinivasulu K, Bairagi KK, Sowmiya KR ..... 55-58

**Inguinal Hernia: a clinical study**

Kumar Pulin Chandra, Brahma Deepanjali ..... 59-62

**Age determination from radiological study of epiphysal appearance and union of distal end of Tibia**

Bhise SS, Pundge SJ, Nanandkar SD, Chikhalkar BG ..... 63-65

**A study on the importance of thumb print in human identification**

Deka Rup Sekhar, Medhi Shobhana ..... 66-69

**Correlation between atherosclerotic plaques in Aorta and morbid pathology of heart**

Tarafder Mainak, Chakravarty Projjal, Bhattacharjee Ankur, Das Somnath, Roy Kallol ..... 70-73

**Study on incidence of PCOS cases in Mumbai region**

Khandare Vinayak Sunny, Nanandkar Digambar Sudhir ..... 74-77

**Detection of pulmonary tuberculosis using cartridge based nucleic acid amplification**

test (CBNAAT) and fluorescent microscopy

Naorem Salinita, Laifangbam Supriya, Mutum Usharani, Huidrom Lokhendro Singh ..... 78-81

**Dermatoglyphics in vitiligo**

Prachi V Gole, Bhalchandra G Chikhalkar, Siddhi B Chikhalkar, Sandeep V Haridas, ..... 82-85

Swapnil A Sanghavi, Uday S Khopkar, Kuber J Bhinde ..... 82-85

**Age estimation of rescued female commercial sex workers and male child laborers in South India**

Sudha R ..... 86-89

**Impact of antenatal care on postnatal outcomes among postnatal women in a selected district hospital, Assam**

Borah Kobita, Talukdar Kunjalal ..... 90-93

**A comparative study of MRI and arthroscopic findings in shoulder pathologies**

Saikia Lelin, Das Chinmoy, Daolagupu AK, Gogoi PJ ..... 94-97

**A study of effect of storage condition on blood alcohol concentration in living subjects**

Kishor kumar DG, Anand P Rayamane, Kumar MP ..... 98-101

### CASE REPORT

**Mercury poisoning with acute kidney injury**

Sharma Manjuri, Mahanta Arunima, Das Himanab Jyoti, Baruah Swaroop Kumar ..... 102-104

**Esthetic rehabilitation of fluorosis affected teeth**

Kataki Rubi, Bora Proxima, Shekhawat Krutika, Neingutunuo Angami ..... 105-107

**Say no to surgery- nonsurgical management of periapical lesions**

Bora Proxima, Shekhawat Krutika, Kataki Rubi, Bhuyan AC ..... 108-110

**Management of temporomandibular joint ankylosis**

Gogoi Rahul, Prasanna A, Bora Debashree, Senapati Miklu, Sharma Arup, Nipan Mahanta ..... 111-113

**Management of complicated crown root fracture using orthodontic extrusion procedure**

Phukan Anuve Hrishik, Chopra Radhika, Bora Neelutpal, Sachdev Vinod ..... 114-116



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## EDITORIAL

# The changing relationship between doctor and patient

**Bhattacharyya NC\***

The doctor patient relationship has been a matter of concern from the ancient times, as evidenced by the Code of Medical Ethics prescribed by Hippocrates in 3<sup>rd</sup> century BC. In older days it was not only a professional relationship, but it also had social and philosophical aspects. It was a noble relationship directly between the physician and his patient. Generally speaking, it was based on mutual respect, knowledge and trust between the patient and his doctor. Until the later part of last century, the codes of medical ethics largely followed the Hippocratic tradition where the physician was held in high esteem, while the rights of the patient were not given due importance. However, the last few decades have witnessed a shift in the situation resulting in increasing empowerment of individuals, emergence of rights activists and enforcement of laws protecting consumers. The authority of decision making is slowly, but definitely shifting from the physician to the patient. The importance of the changing trends in the doctor-patient relationship is supported by the large number of articles and chapters in books written on this subject in the literature.<sup>1</sup>

In the recent past, several models of doctor-patient relationship had been described. Emanuel and Emanuel<sup>2</sup> introduced four concepts of this relationship. These are:

- (1) Paternalistic model, where the physician acts like the patient's guardian, implementing what is best for the patient. The patient is not given any choice of his own. This model is best implemented in the emergency situations.
- (2) Informative model, where the physician provides the patient with all relevant information so that the patient can agree to which ever intervention is considered to be the best for him/her. Here also the physician holds the responsibility of choosing the treatment modality.
- (3) Interpretive model, where the physician is a counselor explaining to the patient about the various options available. In this model the physician guides the patient to decide about the course of action to be followed.
- (4) Deliberative model, where the physician acts as a friend explaining about the various treatment options available. The patient can actively participate in the discussion and he/she is free to choose the best available option.

The emergence of internet with all health related information available to everyone, has given the impression to a section of the population that they can manage many health related problems on their own, and the doctor may be needed for expert

opinion and technical intervention only.<sup>3</sup> Although some of the information available in the public domain may not be flawless, the educated patient is now more informed about the diseases and treatment options. The modern medicine is mostly evidence based, and consequently the physician is more dependent on the results of investigations rather than the clinical skills. Moreover, the technological advances in the various diagnostic fields have made the results of investigations easily available to the patient. The patient is now in a more advantageous position than before, willing to take part in decision making. Therefore a healthy balance of power is now needed in the form of shared decision making between the patient and the doctor, heralding in the evolution of a modern doctor patient relationship.

Another issue which has further complicated the matter of doctor patient relationship currently is the increasing number of patients a doctor has to attend to, particularly in the government sector because of the rising population and insufficient number of doctors available in government service.<sup>4</sup> Lack of sufficient time devoted for patient care leaves the patient feeling unsatisfied, which may result in 'doctor-shopping'.<sup>5</sup> The behavior of the patients and their relatives towards the health care professional is equally important, as unfriendly behavior towards the attending doctor tends to distract him, making him liable to make mistakes during a medical procedure. The doctor, on the other hand is expected to maintain his calm and behave in the gentlest way with the patient.

There had been many instances of individuals, clinics, diagnostic centers and hospitals being attacked by the mob on the pretext of 'negligence'. This happens not only in the government health institutions but also to some extent in the private sector health establishments like nursing homes, diagnostic centers and clinics. Government of various states have come out with laws to protect the properties under the Health department, while some of the corporate hospitals had gone to the extent of hiring "Head bouncers" in the hospital premises to protect their employees and properties.

Many other factors have come to play their individual roles in the health care management. The development of the pharmaceutical industry brought in drug trials, aggressive marketing, over the counter availability of medicine, and sponsorship offered to the health care professionals. The other players like nurses, physiotherapists, physician's assistants and paramedics also came into the field, diluting the direct role of the



physician. With technological advances, sophisticated and costly laboratory services, radiological and other imaging techniques are now introduced into the medical profession. With the introduction of multiple inputs, the original doctor-patient direct relationship has become multifaceted.<sup>6</sup> As there are multiple factors, any deficiency or mistake at any level influences the ultimate outcome of treatment, but at the end of the day the doctor is held responsible for it by the patient and the family members.

With the corporate sector entering into health care, there are conflicting and overlapping interests of patients, doctors and management of the organizations. The patient may rightly think whether the doctor is more interested in the welfare of the patient, or the management of the hospital, or about his own income.<sup>1</sup> It is a common knowledge that many corporate sector hospitals provide incentives to doctors for referral of patients for specialized treatment. The press and electronic media play their part to inform the public. As a result, doctors in our country are presently having a poor impression in the public mind.<sup>5</sup>

In the recent years, litigations against doctors for the act of negligence are in the increase. Although it has been observed that most of the medical litigation cases are disposed in favor of the doctors, nevertheless it causes lot of physical and mental trauma to the doctor, spreading the wave of bitterness in the medical community. The family physician concept is gradually becoming a thing of the past, and direct psycho-social contact of the doctor with the patient and the family is slowly disappearing from the scene.

The entry of private sector in medical education has also contributed to the problem. The practice of getting admission into the medical courses by paying huge amount of fees in private medical institutions has lead to a situation where the doctors can have high level of debt or family obligation, for which he or she is compelled to join an employment with maximum monetary gain soon after the qualification is obtained so as to repay the investment as early as possible.<sup>5</sup> They are not very keen to serve the government sector, especially in the rural and small town areas where the income is low and health care facilities are poor.

#### **Over the years, two classes of doctors are emerging in our country:**

(a) Those who are working in the government health care services in medical college hospitals, district and sub-divisional hospitals, CHCs and PHCs, in private clinics in small towns and semi-urban areas. This is a very large work-force of professionals working all over the country, although with limited facilities and financial

return, and they mostly bear the brunt of public fury.

(b) The other class is concentrated in urban areas, working in corporate hospitals with better facilities at work place and better financial returns. They are mostly specialists and super-specialists. Although they are not immune to public wrath, the preference is always there for obvious reasons, and most of them work with indemnity cover. They are not supposed to look into the financial background of the patients, with no worry about cost of investigations and treatment, because only the rich can afford it.

Thus there is an inequity of health care delivery system in the country. A large section of the people in our country knows it and the poor and middle class people always feel neglected. This is the underlying cause of all anger and frustration in the public mind manifested as violence against the health establishments of our country today.

In this present scenario, the original noble doctor-patient relationship seems to be losing importance and very soon it may be a thing of the past. However, there has been increasing awareness amongst the medical fraternity for improvement of doctor patient relationship. Most agree that many doctor patient conflicts can be avoided by proper communication and discussion, shared decision making, and taking a little more time in reassuring the patient and the family members in the old fashioned way. This can be easily accomplished without any financial burden. But the more difficult problem is how to bridge the huge crevice between the two classes of doctors representing the two different standards of health care in our country. Until some solution can be found out for this problem, the conflict will continue.

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## REVIEW PAPER

# Rationale behind using stress MRI over nuclear imaging for cardiac ischemia evaluation

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## ABSTRACT

**Introduction:** There are different methods for evaluating cardiac ischemia in a noninvasive way, most commonly used is nuclear stress testing. Another commonly performed investigation to evaluate coronary artery disease in symptomatic patients is coronary CT angiography. On one hand, coronary CT angiography provides anatomic information and stress testing using different modalities provides physiologic information. This physiologic information plays an important role in patient management than mere anatomic narrowing seen on CT angiography. **Objectives:** In this article, we are highlighting the role of cardiac MRI in this critical situation and its value over nuclear stress test. We will also discuss how cardiac MRI can help obtaining more added informations and obtaining differential diagnosis not always possible with nuclear imaging.

**Discussion:** With continued advancement of MRI, stress MRI imaging is becoming another important modality and frequently used now a day to look for cardiac ischemia. This imaging modality provides physiologic information as stress nuclear imaging and also provides anatomic information. Delayed contrast enhanced imaging with MRI helps identifying areas of scar tissue and quantifying areas of viability. With MRI characterization of ischemic vs. non-ischemic cardiomyopathy is possible. **Conclusion:** On this article, we are highlighting the role of cardiac MRI evaluating cardiac ischemia and its value over nuclear stress test.

**Keywords:** Coronary Artery Disease, Ischemic Heart Disease, Stress Cardiac MRI

## INTRODUCTION

Evaluating cardiac ischemia and timely intervention helps preventing catastrophic effect of coronary artery disease. Clinical and electrocardiographic (ECG) evaluations are not always optimal to assess cardiac ischemia.<sup>1</sup> In fact, stress echocardiography is also significantly limited for this. While conventional catheter

angiography remains the gold standard for diagnosis and management of an acute ischemic event, there are several noninvasive modalities for patients with chronic ischemic heart disease. These include stress echocardiography, treadmill ECG, and nuclear perfusion. More recently, coronary computed tomography angiography (CTA) has gained lot of importance as it has an advantage of detecting coronary anatomy and stenosis. However, perfusion imaging is one of the modality to evaluate physiologic effect of the vascular stenosis seen in CTA. In many places, nuclear stress imaging is currently one of the commonest investigations to image chronic ischemic heart disease, stable angina, etc. With the continued advancement of pulse sequences, hardware and image reconstruction methods cardiac MRI (Magnetic Resonance Imaging) perfusion scans play an important role in current day practice.

## Indications of Cardiac MRI Stress Perfusion

Commonest indication of stress cardiac MRI is for evaluation of patients with chest pain syndromes who have intermediate probability of coronary artery disease (CAD).

**Some other indications includes:** Chronic angina, Patient with possible non-ischemic cardiomyopathy to rule out ischemic cause

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and when other imaging modalities are contraindicated (e.g. poor echocardiography window in obese patients).

### Contraindications of Cardiac MRI Stress Perfusion

#### Absolute:

1. **Asthma** (ongoing wheezing): However, there are reports of performing adenosine stress test in asthma patients who are adequately controlled. Bronchodilator inhalers are commonly used as premedication.
2. **Heart block**: Second or third degree.
3. **Medications**: Dipyridamole should be stopped for 24 hours before and Methylxanthenes and products containing Methylxanthenes (coffee) should be stopped 12 hours before study.
4. Previous severe allergy to adenosine.
5. Systolic blood pressure less than 90 mm Hg.
6. Unstable angina or ACS (acute coronary syndrome).

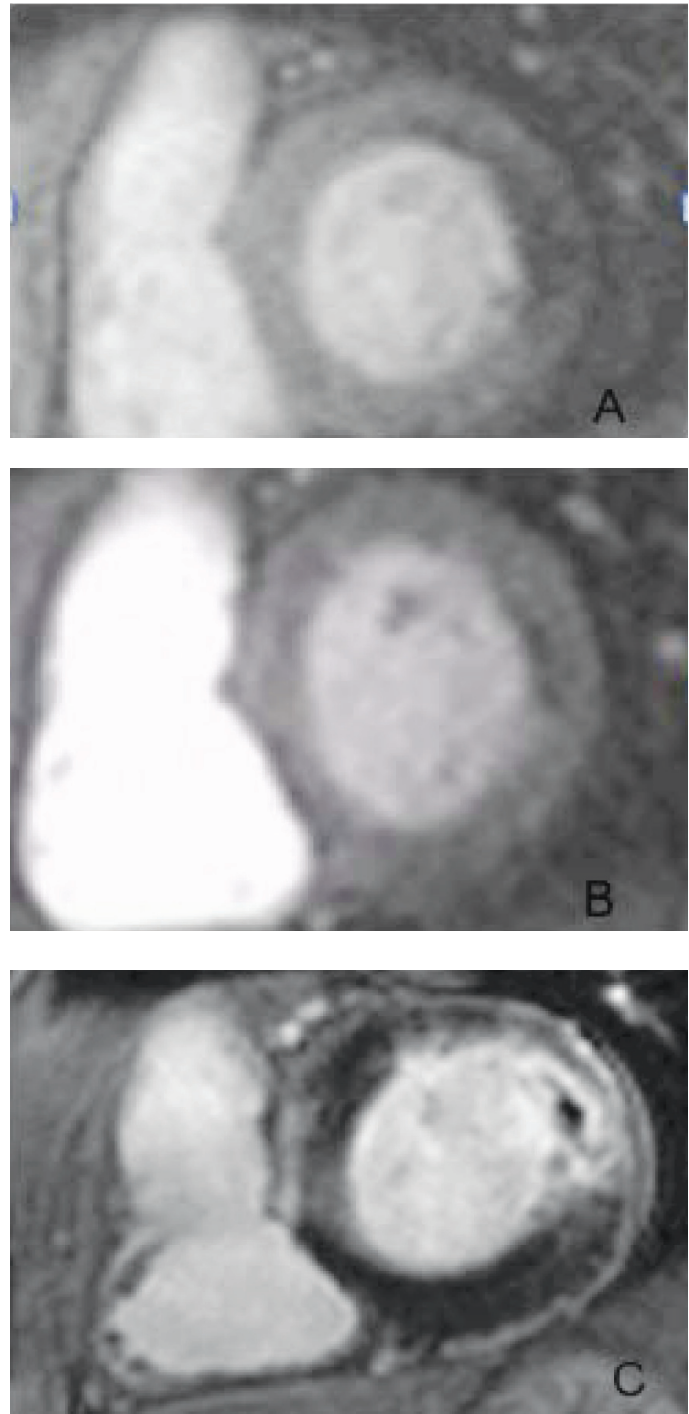
Relative: Sinus bradycardia with a heart rates < 40 beats/minutes.

### PERFORMING A STRESS CARDIAC MRI

**1. Patient preparation:** Patient should be empty stomach for 2 hours before the test. Patient should not drink any caffeine-containing drinks for at least 12 hours prior to the testing. Electrocardiography should be done before and after test. A nurse should evaluate vitals including Pulse, Respiratory rate, Temperature, Blood pressure, etc. Technologist should check for any metallic devices or foreign body with the patient.

**2. Contrast:** For evaluation of cardiac perfusion contrast injection is necessary. The perfusion technique is based on passage of an intravenous injection of bolus gadolinium through myocardium. Gadolinium lowers the T1 property of tissues and gives bright signal on perfusion images.<sup>2</sup> Hence, perfused areas will be relatively bright as compared to the areas with decreased or absent perfusion. This also depends on amount of gadolinium extraction, which is around 0.5 for extracellular gadolinium contrast agents.<sup>3</sup> Myocardial perfusion can be evaluated with cardiac MRI in both qualitative and quantitative methods. There are currently established intravascular contrast agents for cardiac MRI stress perfusion.<sup>4</sup>

**3. MRI Pulse sequences:** As mentioned earlier, T1 contrast is affected significantly due to presence of gadolinium and MR perfusion images are heavily T1 weighted sequences to take advantage of this property. Images are acquired rapidly in the R-R interval with cardiac gating. Depending on the heart rate the R-R interval varies, and 3 to 5 slice locations are possible to acquire perfusion images. Images need to have good spatial resolution to detect subtle changes of perfusion in the subendocardial location. The information can be obtained with inversion recovery (IR) or nonselective saturation recovery (SR) sequences. SR sequences are commonly used due to shorter preparation time and possibility of doing multiple slices at the same time.<sup>5</sup> With advancement of MRI techniques; parallel imaging is routinely used to have faster scanning and better coverage.<sup>3</sup> Tesla MRI is really helpful as compared to 1.5 Tesla scanners.<sup>6</sup> Detailed description of pulse sequences is beyond



**Figure 1** Stress MRI showing perfusion defect and ischemia. Stress perfusion (**Figure 1A**) showing dark area involving lateral wall suggesting left circumflex territory is chemia. There is a smaller dark area in the corresponding lateral wall on rest perfusion (**Figure 1B**) suggesting small area of resting perfusion abnormality. Delayed enhancement image (**Figure 1C**) showing enhancing lateral wall infarct with internal small hypointensity suggesting microvascular obstruction. Region of perfusion abnormality (1A) is more than enhancement (1C) or resting perfusion defect (1B) suggesting infarct with surrounding stress-induced ischemia.

the scope of this article and interest of this journal.

**4. Scanning Protocol:** MRI stress perfusion imaging is usually done with other basic scans to evaluate cardiac function and delayed enhancement. Most commonly the agent used for stress imaging is adenosine (140 ig/kg/min) for duration of 2 to 4 minutes in a rate of 3 to 4 ml/s. A total of 40 – 60 dynamic image frames are obtained. Usually stress perfusion alone is adequate for evaluating ischemia. However, for evaluation of quantitative perfusion values similar perfusion images are also obtained at rest (without injection of adenosine). Stress perfusion can also be done using dobutamine. Some advanced centers are now trying treadmill stress for cardiac perfusion MRI.<sup>7</sup>

**5. Evaluating images:** Both quantitative and qualitative evaluations of stress images possible. Most of the centers worldwide use semi automated softwares for evaluating cardiac perfusion along with functional and delayed enhancement parameters. Overall sensitivity and specificity of evaluating cardiac ischemia using delayed enhancement, stress and rest images are 89% to 87% respectively.<sup>8</sup> Different quantitative parameters can be evaluated with cardiac MRI including time to peak, upslope, peak myocardial enhancement and subepicardial to subendocardial gradient. Using deconvolution method, absolute quantification is possible.<sup>9</sup> In general, darker areas in stress perfusion images without abnormal delayed enhancement and normal rest perfusion suggests areas of ischemia (**Figure 1**).

#### Advantages of cardiac MRI over nuclear stress test

1. Cardiac MRI is much faster as compared to nuclear stress imaging. On an average, stress cardiac MRI examinations take 30-40 minutes and nuclear stress test takes about four hours.
2. MRI is free of radiation. However, nuclear stress test exposes the patient to radiation.
3. Cardiac MRI has significantly higher spatial resolution as compared to nuclear perfusion.
4. Cardiac MRI provides absolute quantification of perfusion and also additional information including cardiac viability, function and morphology. These parameters are evaluated with cardiac MRI at a much higher resolution as compared to nuclear stress imaging or stress echocardiography.
5. Cardiac stress MR has no significant operator dependence.
6. Cardiac stress MR signal intensities are largely independent of patient's body habitus.
7. Cardiac stress MRI also evaluates myocardial viability similar to PET study without exposing the patient to radiation.
8. MRI can give us alternative diagnosis, which may not be possible with other imaging modalities.

#### Limitation of cardiac MRI

1. Dark rim artifact – Sometimes, presence of this artifact can mimic an area of perfusion abnormality. This artifact can be due to cardiac motion, limitation of resolution or susceptibility.<sup>10, 11, 12</sup> This artifact usually disappears during the equilibrium phase of imaging.

2. Limitation of rest perfusion if performed after stress – gadolinium retention in areas after stress perfusion limits evaluation of stress images. However, combined evaluation of delayed enhancement with perfusion imaging helps understanding rest perfusion images.

3. Renal failure patient: Gadolinium is contraindicated in a patient with elevated creatinine and an estimated GFR of less than 30 due to the risk of a rare condition called nephrogenic systemic fibrosis, which may be life threatening.<sup>13</sup> However, dobutamine stress MRI could still be an option. Newer T1 sequences are being developed which depict changes with adenosine stress without using Gd contrast.

#### How to use Cardiac stress MRI in clinical practice

There are available guidelines in the literature for appropriate use of contrast enhanced cardiac MRI including stress MRI for evaluating ischemia.<sup>14</sup> Adenosine stress MRI with intermediate risk patients for cardiac ischemia has a sensitivity of 0.91(95% CI, 0.88 to 0.94) and specificity of 0.81(95% CI, 0.77 to 0.85).<sup>15</sup> Another way to look at the usefulness of cardiac MRI is event rate in patients with known or suspected coronary artery disease. In this group of patient's abnormal stress cardiac MRI has an event rate of 17% compared with 5% with a normal study.<sup>16</sup> Another functional parameter for cardiac is chemia evaluation is measurement of Fractional Flow Reserve (FFR), either with catheter angiography or recently with Computed Tomography (CT). There is a good correlation of cardiac MRI perfusion with FFR by catheter angiography, helping to make a decision of managing cardiac ischemia noninvasively.<sup>17</sup> There are studies comparing contrast enhanced cardiac MRI absolute perfusion reserve with Positron Emission Radiography (PET) and this may be a future direction for evaluating cardiac is chemia.<sup>18</sup>

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## REVIEW PAPER

# Timing of orthodontic treatment

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### ABSTRACT

**Introduction:** The ideal time to commence orthodontic treatment for any given patient has been a controversial issue since the establishment of orthodontia as a specialized science. Clinicians often faced with the dilemma of deciding at what age to refer for a further opinion and treatment. **Objectives:** Present review article looks into both the aspects of orthodontic treatment of various malocclusions which are seen in developing dentition. Evidence in the form of Meta Analysis, Randomized Control Trails has further high lightened that such an approach is not indicated in many cases for which later, one-phase treatment is more effective and efficient. **Discussion:** Understanding proper diagnostic criteria, customized treatment planning considering the patient goal and desire, with problem oriented approach is very important, but there is always a question that is there an “ideal” time for orthodontic treatment, if the clinician wants to maximize the benefits of growth and development without subjecting the child to fixed mechanotherapy for years. There is always certain degree of confusion regarding the early orthodontic treatment which reduces the functional problems and its psychological impact in the future. **Conclusion:** Therefore, it is prudent on the part of clinicians to judiciously decide, on complexity of case, predictability of success and cost benefit basis when to provide orthodontic treatment. Therefore, clinician experience and clinical judgment to advise orthodontic treatment for such a case plays a very crucial role.

**Keywords:** Early, Late, Orthodontic, Malocclusion, Timing, Treatment

### INTRODUCTION

Early, or phase I, orthodontic treatment start during either the primary or transitional period to either prevent, correct or intercept a malocclusion and reduce the need or the time for treatment in the permanent dentition in a manner that will ultimately lead to a better, more stable result than that which would be achieved by starting treatment later.<sup>1</sup> The main objectives of early treatment

is obtaining a skeletal change (structural), providing the opportunity of a functional change in the environment, utilizing the individual growth, eliminating the detrimental habits and taking advantage of the forces of the occlusal development towards the correction of the problem.<sup>2</sup> The present review thus focus relative merits of early treatment in the management of growth related issues and various malocclusion.

Orthodontists have made remarkable progress in understanding physiology, growth, tissue response, increasingly sophisticated diagnostic techniques, available materials, and information. Nevertheless, with all these advances, many practitioners still find themselves at a dilemma to intervene or not to intervene before the eruption of the complete permanent dentition. To be capable of determining the optimum moment to begin treatment, orthodontists must possess a profound comprehensive knowledge, which discrepancies would benefit from early treatment. It is important that orthodontists perform “triage” so that they will not get caught up in a relentless therapeutic cycle leading only to long, drawn-out treatments, patient and parent fatigue, and professional frustration.<sup>3,4</sup>

### EARLY TREATMENT OF CLASS II MALOCCLUSION

Class II malocclusion is a skeletal discrepancy that may be caused by maxillary protrusion, mandibular retraction or a combination of both situations. The treatment can be carried during the pre-puberty stage (early treatment) with Functional appliances by modifying and stimulating growth, restraining it where indicated, or reorienting in order to change neuromuscular behavior and improve the functioning of oral structures, as well as form. The

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primary indication for early intervention in Class II malocclusions remains psychosocial problems and teasing.<sup>5, 6</sup> According to recent research, the main advantages of Class II early treatment were: raise patient self-esteem and family satisfaction (78.5%), reduction of risk of anterior teeth fracture (63.6%), and less extensive orthodontic therapy during the second stage (62.6%).<sup>7</sup> Incompetent lips, a markedly increased over jet and increased incisal exposure at rest predispose, in particular, to dental trauma may derive some benefit from early intervention.<sup>8</sup> Substantial evidence supports the theory that early growth modification therapy can lead to an improvement, if not complete correction, of the Class II malocclusion. Other recent studies suggest that

Successful orthopedic correction through growth modification has increased the nonsurgical correction of the growing class III patient. Understanding Optimal timing for the orthopedic approach to class III malocclusion is important. Recent study of Class III treatment supports using facemask therapy during the primary and early-transitional dentition, although it suggests that treatment at later stages is not without merit.

The Class III skeletal pattern is the result of a small and/or posteriorly positioned maxilla, a large and/or prognathic mandible, or a maxilla and mandible that are normal in the sagittal plane of space but underdeveloped in the vertical dimension. Most often, the Class III malocclusion is caused by a combination of two or



**Figure 1** Early Treatment of Class II Malocclusion with Twin block Appliance

as long as the patient is treated while he or she is still growing, the time at which treatment begins may not make a difference in the success of the Class II correction. Either during maximum pubertal growth spurt, the orthodontist could interfere with the problem in order to produce dentoalveolar movements and skeletal changes; or during adulthood, when due to growth absence the extraction of maxillary premolars is practically always considered, and even orthognathic surgery in more severe cases. Therefore, later-stage, single-phase treatment approach is preferable because of the advantages that accompany the reduced treatment time. However, the impact of early treatment on psychological development has yet to be substantiated. As long as the reasons are clear, the choice of timing comes down to the clinical judgment of the orthodontist in consultation with the patients and families.<sup>9, 10</sup>

### EARLY TREATMENT OF CLASS III MALOCCLUSION

Treatment of class III malocclusion in growing subjects is a challenging part of contemporary orthodontic practice.

all three discrepancies. Protraction headgear or Face mask therapy with or without prior palatal expansion is the most common orthopedic treatment protocol for class III malocclusion.

The typical protocol in facemask therapy is the application of approximately 12 ounces of force on the maxilla for 14 hours a day in a forward and slightly downward direction. Orthodontists most often prescribe facemask therapy for patients in the primary to early transitional dentition, in large part because of the patency of the circummaxillary sutures appropriate to this age. Growth modification of this kind is based on the premise that applying tension to these immature sutures is a stimulus for the formation of new bone. Although a significantly greater correction of the Class III pattern was observed in 4- to 10-year-olds than in 10- to 13-year-olds, the effect of age on treatment response was less than would be commonly expected.<sup>11, 12, 13</sup>

### EARLY TREATMENT OF TRANSVERSE DISCREPANCIES

Skeletal or dental discrepancies in the transverse plane manifest either as crossbites unilaterally or bilaterally. Correction involves



**Figure 2** Early Treatment of Class III Malocclusion with Orthopedic Appliance

either dental or palatal expansion which can be undertaken with fixed or removable appliances. Many authors consider that widening of the midpalatal suture is a suitable method for treating maxillary arch size discrepancies. Rapid maxillary expansion (RME) is a clinical technique largely employed in orthodontic treatment to manage maxillary transverse deficiencies. The correction of a skeletal cross bite via palatal expansion is generally considered more appropriate in young patients because the sutures are not as interdigitated as in adults. In the early stages of skeletal maturation (that is, before the adolescent growth spurt's peak height velocity), little-to-no midpalatal approximation exists. Therefore, beginning palatal expansion just before the onset of puberty is consistent with the biology of the tissue involved. Once the palatal suture is fused, correction of a skeletal crossbite usually requires surgical intervention. A recent study on modified type of Haas appliance shown increase in the transverse dimension of the maxillary dental arch in the mixed dentition with appropriate timing for treatment to be before the eruption of the permanent lateral incisors. However, for transverse dental discrepancies, dental expansion can be accomplished by simple tooth movement and, preferably done during phase II treatment.<sup>14, 15, 16</sup>

#### EARLY TREATMENT OF ARCH-LENGTH DISCREPANCIES

Treatment of arch-length discrepancies depends on the nature of the crowding. Natural arch development has the potential to correct early mild incisor crowding. Management of the leeway space will resolve a majority of cases of crowding. This approach is best accomplished in the transitional to late-transitional dentition. Severe crowding may warrant the extraction of permanent teeth. A serial extraction protocol may be desirable and the extraction sequence for such an approach begins in the early transitional dentition, while the appliance phase occurs in the early-permanent dentition. To determine the need for and appropriate timing of treatment for arch-length discrepancies, clinicians must be equipped with the knowledge about normal arch development.

gloves, are considered the first line of treatment for open bites related to aberrant habits, such as digit sucking. The use of fixed adjuncts such as tongue spurs to alter tongue posture has been advocated with some retrospective evidence supporting their effectiveness. The early use of myofunctional treatment in an effort to alleviate aberrant neuromuscular behavior has also received some attention.

Growth-related, skeletal open bites require more complex intervention. The ability to alter vertical facial growth is limited and may require sustained intervention. Depending on later growth, for definitive correction in the permanent dentition may be more amenable. Treatment methods including high-pull orthopedic headgear directed through the centre of the resistance of the maxilla, vertical-pull chin cup and high-angle functional appliance can be advocated though with limited evidence of skeletal effectiveness. The advent of temporary anchorage devices has also raised the possibility of posterior intrusion of the dentition to induce open bite closure. The latter, however, more correctly represents a compensation for vertical skeletal excess and while the net effect may well be a decrease in the vertical dimension, the effect is produced through dental intrusion.<sup>17, 18</sup>

#### DEEP BITE

This condition is characterized by either diminished height of the lower face resulting from insufficient vertical skeletal development, or a vertical overgrowth of the maxillary anterior alveolar process which carries the incisal group with it into overbite. By analyzing the separated casts and the cephalometric radiograph, the orthodontist can determine whether a single arch or both arches are implicated in the disorder and whether sufficient posterior vertical growth contributes to or causes the problem. The orthodontist should usually defer treating these patients until the mixed or permanent dentition stages. However, in the rare instances when called on to deal with a Class II division 2 type of developing malocclusion in a young child, the orthodontist can use a bite plate or a preformed plastic



**Figure 3** Open Bite Treatment with TAD assisted posterior intrusion

#### EARLY INTERCEPTION OF VERTICAL MALOCCLUSION OPEN BITE

Early correction of an anterior open bite may be attempted by a range of fixed or removable appliances. The treatment technique, the orthodontist chooses and the etiologic factors involved will affect the prognosis. Conservative methods including education intervention and use of barriers, such as plasters, varnishes or

positioning device. A fixed appliance with molar bands, bonded attachments and a maxillary or a mandibular utility arch, or both, for intruding teeth where indicated, will provide the best results.<sup>19, 20</sup>

#### CONCLUSION

The timing of treatment is influenced by various inevitable dental, skeletal, development and maturation differences in different age



groups. Direct comparison of the merits of early or later commencement is complicated. Thus the best timing of orthodontic treatment must be a decision made by the orthodontist, the parent, and the patient based on all the factors that impact success considering the effectiveness and efficiency with cost benefit ratio. All options should be reviewed and considered to offer optimal time to start treatment that provides best treatment and results.

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## REVIEW PAPER

# Legal and ethical issues of research and publication

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### ABSTRACT

**Introduction:** Legal and ethical issues of research and publication form an important component of scientific writings, mainly related to the research participant, researcher and publication. **Methods:** Collecting anecdotes published in different newspapers and journal, this article seeks to briefly review the various international and national guidelines and regulations that exist on issues related to biomedical research and publication. **Discussion:** The issues of dignity, bodily integrity, autonomy and privacy, providing incentives of research participants and various forms of research misconduct and unethical practice in part of research activities are the burring issues discussed in present day scenario. Relevant international and national declaration and treaties form the literature that are relevant to the ethical and legal aspects of conducting research and publication that researchers should abide by when conducting biomedical research. Researchers should note the major international guidelines as well as the national regulations and legislation. **Conclusion:** Hence all proposals on biomedical research involving human participants should be cleared by an appropriately constituted local Institutional Ethics Committee (IEC).

**Keywords:** Biomedical research, ethics, informed consent, plagiarism, scientific misconduct

### INTRODUCTION

The conduct of biomedical research involving human participants raises a host of ethical and legal and political issues that have concerned philosophers, lawyers, policy makers, scientists, and clinicians for many years.<sup>1</sup>

The Declaration of Helsinki established ethical principles applied to clinical research involving human participants. The purpose of a clinical research is to systematically collect and analyse data from which conclusions are drawn, that may be applied, so as to improve the clinical practice and benefit patients in future.<sup>2</sup> Mastery and proficiency on the subject will help a medical writer in dealing with issues of research misconduct which might be challenging both in legal as well as ethical aspects in their experiments, studies and publication.<sup>3</sup>

Here in this article, a brief review on the legal and ethical issues on biomedical research involving human as research participant, basic principles of informed consent and precautions to be taken during collection of data in the process of clinical research and its publications were discussed.

### ISSUES RELATED TO THE RESEARCH PARTICIPANTS

The main role of human participants in research is to serve as sources of data. Researchers have a duty to 'protect the life, health, dignity, integrity, right to self-determination, privacy and confidentiality of personal information of research participants'.<sup>4</sup> All the research involving HPs should be conducted in accordance with the **four basic ethical principles**, namely:

- ♦ **Autonomy** (respect for person)- Acknowledge a person's right to make choices, to hold views, and to take actions based on personal values and beliefs.
- ♦ **Beneficence** (do well) - Provide benefits to persons and contribute to their welfare. Refers to an action done for the benefit of others.
- ♦ **Non-maleficence** (do no harm) - Obligation not to inflict harm intentionally; In medical ethics, the physician's guiding maxim is "First, do no harm."
- ♦ **Justice** - Treat others equitably, distribute benefits/burdens fairly.

Mistreatment of research participant is considered as research misconduct viz., no ethical review approval, failure to follow approved protocol, absent or inadequate informed consent, exposure of subjects to physical or psychological harm, exposure of subjects to harm due to unacceptable research practices or failure to maintain confidentiality, etc.<sup>5</sup> There is also scientific

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misconduct involving fraud and deception. There is also scientific misconduct which involves fraud and deception.<sup>3</sup> **Scientific misconduct** means fabrication, falsification, plagiarism, or other practices that seriously deviate from those that are commonly accepted within the scientific community for proposing, conducting or reporting research<sup>6</sup>are also increasing in modern day research and publications.

**Informed consent**

Informed consent should be looked on as a process rather than a signature on a form. This process includes a mutual sharing of information over a time between the clinician and the patient to facilitate the patient’s autonomy in the process of making ongoing choices.<sup>8</sup> To be valid informed consent the subject must be competent, researcher must give a full disclosure, subjects must understand what the researcher tells them and subject’s decision to participate must be voluntary. Consent taken from the patient for trial of drug or therapy which is not as per the guidelines of ICMR shall also be construed as misconduct.<sup>12</sup> However, additional relevant information must be provided in clinical trials or research studies in informed consent form as shown in **Table 1** [Adapted from International Conference on Harmonisation (ICH) Harmonised Tripartite Guideline, Guideline for Good Clinical Practice E6 (R1)].<sup>9</sup>

Table 1 Essential components of an informed consent <sup>9</sup>	
A statement mentioning the study that involves research	
Study information: Protocol title, name and contact details of principal investigator, funding resources of the study	
The purpose of the research study and the duration of the participation	
The study procedures and visit schedule	
The participants’ responsibilities in the study	
What happens if the participant withdraws from the study	
A clear statement what is experimental in the study	
A disclosure of appropriate alternative procedures or courses of treatment, if any, that might be advantageous to the subject	
The possible risks, discomforts and inconveniences in the study	
The potential benefits for the participants	
The participants’ rights	
The extent of confidentiality of study and medical records	
Any cost of participation	
Possible researchrelated injury and compensation (including insurance coverage to provide treatment for injury arising from participation)	

A statement that the subject or the subject’s legally acceptable representative will be informed in a timely manner if additional information becomes available
The contact details if participants have questions regarding the study or regulatory policy
The approximate number of subjects involved in the trial

All the relevant information should be given in the language and method that individual participant can understand<sup>4</sup> commonly in the form of a printed ‘**Participant Information Sheet**’. The research participants must be informed about the right to refuse to participate or withdraw consent to participate at any time without reprisal and without affecting the patient–physician relationship. There are also general principles regarding risk assessment, scientific requirements, research protocols and registration, function of ethics committees, use of placebo, post-trial provisions and research publication.<sup>4</sup>

**Special population**

There is nothing wrong in obtaining informed consent from a subject if he or she is above 12 years of age, conscious and mentally sound and which is given freely, voluntarily and directly without fear, force or fraud (Sec. 88IPC). However, informed consent should be sought from a legally authorised representative if a potential research subject is incapable of giving informed consent or is unconscious or is insane (Sec. 89IPC).<sup>4</sup> The ‘legally authorised representative’ may be a spouse, close relative, parent, power of attorney or legally appointed guardian. The hierarchy of priority of the representative may be different between different countries and different regions within the same country; hence, local guidelines or laws should be consulted.<sup>2</sup>

**Emergency medical condition and consent for research**

Emergency research studies occur where potential subjects are incapacitated and unable to give informed consent (acute head injury, cardiac arrest). The Council for International Organisations of Medical Sciences/World Health Organisation guidelines and Declaration of Helsinki make exceptions to the requirement for informed consent in these situations<sup>4, 9</sup> which has minor variations in laws governing the extent to which the exceptions apply in these situations.<sup>10</sup>

Every effort should have been made to find a legal authority for obtaining consent failure to which and if not enough time is available an ‘exception to informed consent’ may allowed the subject to be enrolled with prior approval of an ethical committee.<sup>9</sup> Researchers must obtain informed consent retrospectively as soon as possible from the subject on regaining his consciousness, or from their legal gradients when available, for continued participation of the research.<sup>4, 9</sup>

**Data collection and maintenance of confidentiality**

As per ‘The Health Insurance Portability and Accountability Act’ there are requirements for informed consent disclosure and standards for electronic exchange, privacy and information security. In the UK, generic legislation is found in the ‘Data Protection Act’.<sup>11</sup>

The International Committee of Medical Journal Editors (ICMJE) recommendations suggest that authors must ensure that non-essential identifying information (names, initials, hospital record numbers) are omitted during data collection and storage wherever possible. Where identifying information is essential for scientific purposes viz., clinical photographs, written informed consent must be obtained and the patient must be shown the manuscript before publication. Subjects should also be informed if any potential identifiable material might be available through media access. However, if his or her identity is distorted then no need to have consent.

**Providing incentives:** Cash or other benefits ‘in-kind’ (financial, medical, educational, community benefits) should be made known to subjects when obtaining informed consent without emphasising too much on it.<sup>9</sup> Benefits may serve as appreciation or compensation for time and effort, but should not result in the inducement to participation.<sup>13</sup> The amount and nature of remuneration should be compared to norms, cultural traditions and are subjected to the Ethical Committee Review.<sup>9</sup>

A medical practitioner (MP) may carry out, participate in, work in research projects funded by pharmaceutical and allied healthcare industries. The MP is obliged to know the fulfillment of certain criteria’s mentioned in **Table 2** which will be a necessity for undertaking any research assignment/project funded by industry– for being proper and ethical.<sup>12</sup>

**Table 2** Criteria as per Chapter 8:8(e) medical research<sup>12</sup>

i.	Ensure that the particular research proposal(s) has due permission from the competent concerned authorities.
ii.	Ensure that such a research project(s) has the clearance of national/state/institutional ethics committees/bodies.
iii.	Ensure that it fulfills all the legal requirements prescribed for medical research.
iv.	Ensure that the source and amount of funding is publicly disclosed at the beginning itself.
v.	Ensure that proper care and facilities are provided to human volunteers, if they are necessary for the research project(s).
vi.	Ensure that undue animal experimentations are not done and when these are necessary they are done in a scientific and a humane way.
vii.	Ensure that while accepting such an assignment a medical practitioner shall have the freedom to publish the results of the research in the greater interest of the society by inserting such a clause in the MOU or any other document/agreement for any such assignment.

ISSUES RELATED TO THE RESEARCHERS

Ethical guidelines for biomedical research

All institutions in the India, which carry out any form of biomedical research (BMR) involving human as research participant (HP), should follow the ICMR guidelines in letter and

spirit to protect the safety and well-being of all individuals. It is mandatory that all proposals on BMR involving HP should be cleared by an appropriately constituted **Institutional Ethics Committee (IEC)**.<sup>14</sup>

Avoiding bias, inappropriate research methodology, incorrect reporting and inappropriate use of information

Good, well-designed studies advance medical science development. Poorly conducted studies violate the principle of justice, as there are time and resources wastage for research sponsors, researchers and subjects, and undermine the societal trust on scientific enquiry.<sup>15</sup> The Guidelines for Good Clinical Practice (GCP) is an international ethical and scientific quality standard for designing, conducting, recording and reporting trials.<sup>16</sup>

Scientific misconduct

*De novo* data invention (fabrication) and manipulation of data (falsification)<sup>7</sup> constitute serious scientific misconduct. The true prevalence of scientific fraud is difficult to measure; however, it is about 2%–14%.<sup>17</sup>

Plagiarism

Plagiarism is the use of others’ published and unpublished ideas or intellectual property without attribution or permission and presenting them as new and original rather than derived from an existing source.<sup>18</sup> Tools such as similarity check<sup>19</sup> are available to aid researchers detect similarities between manuscripts, and such checks should be done before submission.<sup>20</sup> Self-Plagiarism is the verbatim copying or reuse of one’s own research (IEEE Policy statement). Both types of plagiarism are considered to be unacceptable practice by most scientific publications. Plagiarism is a growing burning problem in **scientific research** and probably the commonest ethical issue **corrupting** medical writing. It threatens the **integrity of academic research and publication**. There are evidences that it handicaps the true findings. It also violates the code of Medical Ethics Regulations, 2002.

Overlapping publications

Duplicate publications violate international copyright laws and waste valuable resources.<sup>21, 22</sup> Such publications can distort evidence-based medicine by double-counting of data when inadvertently included in meta-analyses.<sup>21</sup> This practice could artificially enlarge one’s scientific work, distorting apparent productivity and may give an undue advantage when competing for research funding or career advancement.<sup>22</sup>

Duplicate publication, redundant publication

Publication of a paper that overlaps substantially with one already published, without reference to the previous publication.<sup>15</sup>

Salami publication

Slicing of data from a single research process into different pieces creating individual manuscripts from each piece to artificially increase the publication volume.<sup>21</sup> Such misconduct may lead to retraction of articles.

Research Misconduct

Clinical drug trials or other research involving patients or



volunteers as per the guidelines of ICMR can be undertaken, provided ethical considerations are borne in mind. Violation of existing ICMR guidelines in this regard shall constitute misconduct in India.<sup>12</sup>

### Copyright

Usually, sponsors and authors are required to sign over certain publication rights to the journal through copyright transfer or a licensing agreement; thereafter, authors should obtain written permission from the journal/publisher if they wish to reuse the published material elsewhere.<sup>7</sup>

### Issues related to authorship

The ICMJE recommendation lists four criteria of authorship:

1. Author must substantially contribute to the conception, designing of the work, acquisition, analysis, or interpretation of data related to the study
2. Not only drafting of the work, but also revising it judgmentally for drawing scholarly content;
3. Have to approve the final version of the paper for publication and
4. Agreement to the accountability of all related aspects of the study in regards to integrity and accuracy of the topic investigated there of and resolved.

The researchers and authors have an ethical as well as legal obligation to ensure the accuracy of data, publication and dissemination of the result of research.<sup>4</sup> The author should disclose the relevant corrections, retractions and errata, to protect scientific integrity of published evidence to the journal, etc. Sponsors of clinical trials must allow all study data set for publication.<sup>23</sup>

### Contributors other than author

The contributors of the manuscript who does not qualify any criteria as mentioned by ICMJE for authorship should not be mentioned as co-author, etc. All those should be acknowledged duly in the acknowledgement section after the conclusion. For example: Acquisition of funding, writing assistance, technical editing, language editing, proof reading, general supervision of a research group and general administrative support. Their contribution must specify in the declaration, i.e., served as scientific advisors, critically reviewed the research proposal, collected and compiled data, participated in writing or technical editing of the manuscript, etc.<sup>24</sup> The author should also declare the potential conflicts of interest. The Council of Scientific Editors has identified several inappropriate types of authorship, such as guest authorship, honorary or gift authorship and ghost authorship.<sup>7</sup>

### CONCLUSION

Concerns regarding ethical and legal issues in relation to research and publication has increased day by day with due increase of research activities. The guidelines laid down by different organizations and authorities both at international and national level serve as a guide to promote integrity, fulfilment of ethical and legal standards in the conduct of research as well as in publication.

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## ORIGINAL PAPER

# Study of incidence of externally visible congenital anomalies in stillbirth human foetuses of Manipuri origin

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## ABSTRACT

**Introduction:** Birth defect, congenital malformation, and congenital anomaly are synonymous term use to describe structural, behavioral, functional, and metabolic disorders present at birth. Causes of congenital anomalies are often divided into genetic and environmental factor. For 50-60% of congenital anomalies the etiology is unknown. In the present study, we only look for visible gross anomalies thereby the exact definition of congenital anomaly may not be fulfilled. **Materials and method:** Study was conducted in the Department of Anatomy, Regional Institute of Medical Sciences, Imphal, for the period of 1 year, i.e., from 1st August 2011 to 1st August 2012. 120 numbers of stillbirth human foetuses were collected from the department of Obstetrics and Gynecology, RIMS, Imphal with a due permission from ethical committee. The specimens were preserved in 10% formalin. After 2 weeks specimens were observed carefully for any visible anomalies. **Results:** Out of 120 foetuses; 15 foetuses, i.e., 12.5% were found to have congenital anomalies. The commonest anomaly is craniofacial anomaly (6.666%) in the form of anencephaly and cleft lip and palate. Next to craniofacial anomaly is vertebral arch defect in the form of spina bifida (2.5%). Other anomalies are abdominal wall defect and limbs defects, each contributing 1.666% of the total anomalies in the present study. **Conclusion:** The incidence of congenital anomalies in the present study is 12.5%. The commonest anomaly encountered is in the form of craniofacial anomalies. This high of incidence congenital anomalies encountered in this study may be due to the fact that the study was conducted only in stillbirth human foetuses. Further research is recommended in order to pinpoint the causes of these of anomalies with the use of modern sophisticated tools.

**Keywords:** Anomalies, stillbirth, craniofacial, fetuses

## INTRODUCTION

Birth defect, congenital malformation, and congenital anomaly are synonymous term use to describe structural, behavioral, functional, and metabolic disorders present at birth.<sup>1</sup> Causes of congenital anomalies is often divide into genetic and environmental factor. For 50-60% of congenital anomalies the etiology is unknown.<sup>2</sup> A major congenital anomaly is a structural or functional defect which is of prenatal in origin and present at the time of live birth or foetal demise or in utero; affecting the health, survival, physical or cognitive functioning of an individual.<sup>3</sup> In contrast minor anomalies are those with little or no impact on health or short term or long term function.<sup>4</sup>

In the present study, we only look for externally visible anomalies; thereby the exact definition of congenital anomaly may not be fulfilled.

## METHODS

Study was conducted in the Department of anatomy, Regional Institute of Medical Sciences, Imphal for the period of 1 year i.e. from 1st August 2011 to 1st August 2012. 120 numbers of still birth human foetuses were collected from the department of Obstetrics and Gynecology, RIMS, Imphal with a due permission from ethical committee. The specimens were preserved in 10% formalin. After 2 weeks specimens were observed carefully for any visible anomalies.

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## RESULTS

Out of 120 fetuses; 15 fetuses i.e. 12.5% were found to have congenital anomalies. The commonest anomaly is craniofacial anomaly (6.666%) in the form of anencephaly (**Figure 1**) and cleft lip (**Figure 2**) and palate. Next to craniofacial anomaly is vertebral arch defect (**Figure 3**) in the form of spina bifida (2.5%). Other anomalies are abdominal wall defect (**Figure 4**) and limbs defects (**Figure 5**), each contributing 1.666% of the total anomalies in the present study.

**Table 1** Incidence of cases

Cases	Nos.	%age
No visible anomaly	105	87.5
Craniofacial anomaly	8 (6 male & 2 female)	6.666
Vertebral arch defect	3 (2 male & 1 female)	2.5
Abdominal wall defect	2 (1 male & 1 female)	1.666
Limbs defect	2 (both are male)	1.666



**Figure 1 & Figure 2** Craniofacial abnormalities in the form of anencephaly and cleft lip respectively



**Figure 3 & 4** Vertebral arch defect and abdominal wall defect in the form of lumbar meningomyelocele and gastroschisis respectively



**Figure 5** Showing malrotation of lower limbs

## DISCUSSION

Different authors give different opinion regarding the incidence of congenital anomalies. Variations of incidence may vary from race to race and also influenced by environmental factors.

Gadow EC<sup>5</sup> and Al-Jama F<sup>6</sup> reported that the incidence of congenital anomaly is 3-5%. Many authors stated that the incidence of congenital anomalies of central nervous system was highest among all types of congenital anomalies; neural tube defects being the commonest one. Meningocele, meningomyelocele and anencephaly accounts for more numbers of anomalies in CNS and they were more common in stillborn,<sup>7,8</sup> whereas Mishra PC & Baveja R,<sup>9</sup> found higher incidence of multiple congenital anomalies. On the other hand Hatibaruah A, Hussain M<sup>10</sup> and Gosh et al<sup>11</sup> found higher incidence of musculo skeletal system malformation. Shah K, Pensi CA<sup>12</sup> and Hatibaruah A, Hussain M,<sup>10</sup> reported the higher incidence of congenital anomalies among male fetuses.

In the present study we found that the incidence of congenital anomalies is 12.5%. Craniofacial anomalies in the form of anencephaly and cleft lip and palate contribute the maximum among all types of congenital anomalies. Central nervous system anomalies in the form of craniofacial anomaly with vertebral arch defects are the commonest cause. This present finding is inconformity with the findings of Gupta S et al<sup>7</sup> and Guha DK, Bhatia S<sup>8</sup> but refutes statement given by the Mishra PC, Baveja R,<sup>9</sup> Ghose et al<sup>11</sup> and Hatibaruah A, Hussain M<sup>10</sup> as they reported high incidence of multiple congenital anomalies and musculo skeletal malformation respectively. The incidence (i.e., 12.5%) of congenital anomalies in the present study is very high as compared to the incidence reported by Gadow EC<sup>5</sup> and Al-Jama F.<sup>6</sup> The reason for this high incidence may be due to the fact that the present study was conducted only in still birth human fetuses. The present finding regarding higher incidence among male fetuses is comparable with the finding reported by Hatibaruah A, Hussain M,<sup>10</sup> and Shah K, Pensi CA.<sup>12</sup>

## CONCLUSION

The incidence of congenital anomalies in the present study is 12.5%. The commonest anomaly encountered is in the form of craniofacial anomalies. This high of incidence congenital anomalies encountered in this study may be due to the fact that the study was conducted only in stillbirth human fetuses. Further research is recommended in order to pinpoint the causes of these of anomalies with the use of modern sophisticated tools.

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**Authors contribution:** We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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## ORIGINAL PAPER

# The clinical profile and histological variations of Medulloblastoma in North East India

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## ABSTRACT

**Introduction:** Medulloblastoma is the most common embryonal central nervous system (CNS) tumor of childhood. Medulloblastoma comprises up to 38% of all pediatric posterior fossa tumour. **Objectives:** To study the clinical presentation of medulloblastoma with regards to variables like age, sex, etc., the CT, MRI features and the various histological types, the modes of management and outcome of the patients belonging to the Northeast India. **Method:** This prospective study done in the Department of Neurosurgery Gauhati Medical College and Hospital from January 2010 to December 2016. A total of 65 patients were included in the study. **Results:** Most cases belonged to the paediatric age group with only 4.6% cases above 15 years. Male comprised 61.5% and female 38.4% with male to female ratio 1.6:1. Classical type was the most common with 51(78.4%) cases. Desmoplastic variant comprised 12(18.4%) cases and was seen in older age. Classical variants appeared as homogenous mass in CT scan while the desmoplastic and anaplastic variant appeared as heterogenous mass. Classical variants 49(75.3%) were mostly vermian in location. Heterogeneity is more common in the older age group and it is more prominent in MRI than CT. Gross total excision was done in 51(78.46%) cases and near total was done in 14(21.5%) cases. Recurrence was noted in 6 cases. **Conclusion:** Medulloblastoma is commonly seen in paediatric age and more common in males. Classical variant was the most common type with mostly vermian location. CT and MRI features varied in different variants of medulloblastoma. In most of the cases gross total excision was possible and surgical outcome is favorable.

**Keywords:** Posterior fossa tumor, Childhood tumour

## INTRODUCTION

Medulloblastoma is the most common embryonal central

nervous system (CNS) tumor of childhood<sup>1</sup> and is comprised of biologically different subsets of tumors arising from stem and/or progenitor cells of the cerebellum. Although it accounts for 6%–8% of all central nervous system tumours and 12%–25% of such tumors in the pediatric age group, it constitutes only 0.4%–1% of all adult central nervous system tumors.<sup>2, 3</sup> Medulloblastoma comprises up to 38% of all pediatric posterior fossa tumours and represents the most common pediatric posterior fossa tumour. The term Medulloblastoma cerebelli was introduced by Bailey and Cushing in 1925 to refer a distinct, highly malignant, small cell tumour of the midline cerebellum.<sup>4</sup> Medulloblastoma is believed to be derived from the granule-cell progenitors which are located in the external granular layer of the cerebellum.<sup>5, 6</sup> This is a germinal zone harboring actively proliferating progenitor cells originating from the rhombic lip during embryonic development.<sup>7</sup> The external granular layer eventually disappears as all cell division ceases and all post mitotic neurons move to the internal granular layer.<sup>8</sup> According to most accepted hypothesis medulloblastoma arise from remnants of undifferentiated neuroepithelial cells in the region of cerebellar vermis or inferior medullary vellum.<sup>9</sup> The cerebellum is the most common location for medulloblastomas (94.4% of cases), and most (>75%) of these arise in the midline cerebellar vermis. WHO recognizes five histological subtypes: Classic,

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anaplastic, large cells, desmoplastic/nodular, and medulloblastoma with extensive nodularity (MBEN), although majority of studies have combined large cell/anaplastic phenotypes. Classical MBs, which comprise 65% of cases, consist of sheets of undifferentiated small, round cells with characteristic high cytoplasmic-to-nuclear ratio. Anaplastic/large cell tumors are more aggressive tumors, characterized by pleomorphic cells and high mitotic indexes compared to other types of MB. Desmoplastic/nodular MBs contain areas of more differentiated, non-proliferative cells (nodules) that are reticulin negative surrounded by areas of desmoplasia. MBEN tumors display larger and more frequent nodules than Desmoplastic/nodular tumors. Prognosis for MBEN and desmoplastic/nodular patients is more favorable than for those with classical MB, while large cell/anaplastic tumors are associated with the worst prognosis.<sup>10</sup>

### OBJECTIVES

In this study we will observe the clinical presentation of medulloblastoma with regards to variables like age, sex, etc., the CT, MRI features and the various histological types of medulloblastoma, the modes of management and outcome of the patients belonging to the Northeast India.

### METHODS

The present study is a prospective study done in the Department of Neurosurgery, Gauhati Medical College and Hospital from January 2010 to December 2016. A total of 65 patients were included in the study. All patients were thoroughly evaluated and prepared for operative procedure and post operatively confirmed by histopathological reports. Patients there after under went radiotherapy and chemotherapy as per protocol.

**Inclusion criteria:** Only biopsy confirmed medulloblastoma cases were included in the study.

**Exclusion criteria:** The cases which were not indicative of medulloblastoma, after comprehensive summation of the history, pertinent clinical findings and pathologic characteristics associated with this tumor, were excluded from the study.

### RESULTS

**Age Distribution:** In our study of the total 65 cases, 42(64.6%) belong to 5-15 years and constituted the most common age group. 11 cases (16.9%) belong to 3-5 years group, 9 cases (13.8%) in 0-3 years and 3 cases (4.6%).

**Sex Distribution:** Of total 65 cases, 40(61.5%) were male and 25(38.4%) were female and male to female ratio was 1.6:1

**Signs and symptoms according to age distribution:** In our study as shown in table 1 all cases presented with headache, vomiting was seen in 51(78.4%) cases. Anorexia with weight loss was seen in 21(32.3%) cases and lethargy in 20(30.7%) cases. Imbalance was seen in 43(66.1%) cases, papilledema was seen in 22(33.8%) and decreased vision in 16(24.6%) cases. Trance ataxia was seen in 29(44.6%) cases and appendicular ataxia in 8(12.3%) cases.

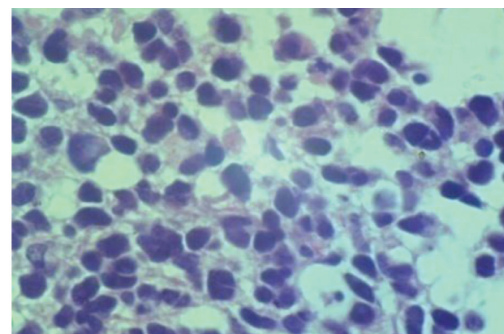
**Table 1** Sign and symptoms

Symptoms and sign	Age group in years			
	0-3 years	3-5 years	5-15 years	>15 years
Headache	9	11	42	3
Vomiting	9	6	35	1
Lethargy	5	4	10	1
Anorexia /weight loss	6	5	9	1
Impaired consciousness	5	0	3	1
Trance Ataxia	7	8	13	1
Appendicular ataxia	2	0	4	2
Head tilt	4	3	7	0
Nystagmus	3	0	6	2
Impaired Vision	3	1	11	1
Papilledema	5	1	15	1
Seizure	0	0	0	0
Imbalance	7	10	25	1
Cranial nerve Palsy	3	1	11	1

**Histological variations depending on age:** In our study as shown in table 2 classical variant was the most common type with 51(78.4%) cases and most belong to 5-15 years with 32(49.2%) cases. Desmoplastic variant comprised 12(18.4%) cases and anaplastic variant comprised 2 cases. Figure 1, 2, 3 shows the histological slides of various types.

**Table 2** Histological variant and age group

Histological Types	0-3 yr	3-5yr	5-15yr	>15yr
Classical	8	10	32	1
Desmoplastic	0	1	9	2
Anaplastic	1	0	1	0
Large Cell	0	0	0	0
MBEN	0	0	0	0



**Figure 1** Classical type 100x

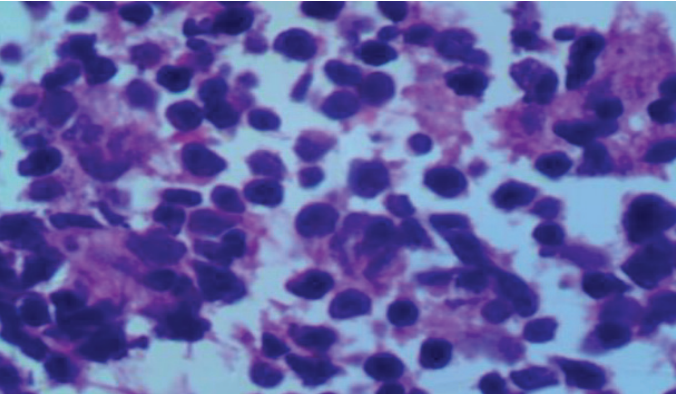


Figure 2 Desmoplastic 100x

**Histological variations depending on sex:** In our study of 51 classical types, 33(50.7%) cases were male and 18(27.6%) cases were female. Of 12 Desmoplastic type 7(10.7%) were male and 5(7.6%) were female. Both the two cases of anaplastic variant were female.

**Histological variation and tumour location:** In our study of the classical variants 49(75.3%) were vermian and 2(3.07%) were paravermian in location. In the desmoplastic variety 7(10.7%) were paravermian and 5(7.6%) were lateral in location. Two anaplastic variant were paravermian in location.

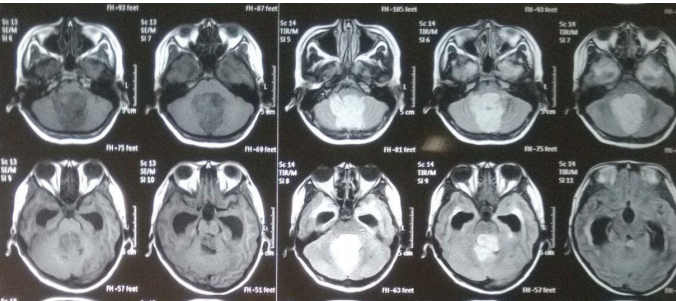


Figure 4 T1 and T2 MRI of medulloblastoma case

**Histological variations and MRI signal intensity:** On T1 weighted images classical variant showed hyointensity in 49(75.3%) cases and 2(3.07%) cases showed isointensity and correspondingly on T2 images 49(75.3%) cases showed hyperintensity and 2(3.07%) cases showed isointensity. In the desmoplastic variant in T1 weighted images 7(10.7%) cases showed hypointensity and 5(7.6%) cases showed isointensity

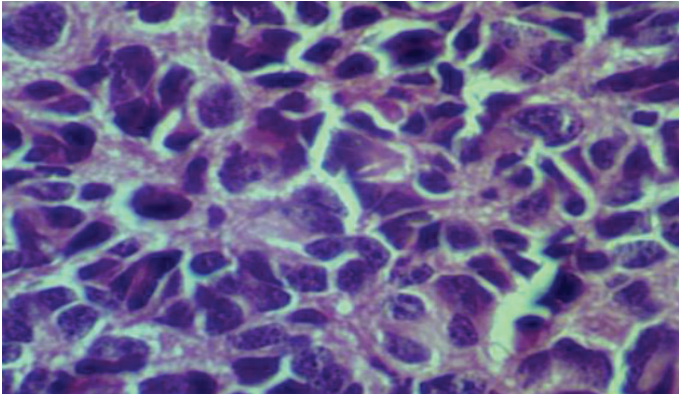


Figure 3 Anaplastic 100x

while in T2 images of desmoplastic variant 2(3.07%) cases showed hyperintensity and 10(15.3%) cases showed is intensity. Of the anaplastic variant in T1 weighted images 1 showed hypointensity and 1 showed isointensity while both appeared hyperintense in T2 weighted images. Figure 4 shows the MRI features of medulloblastoma.

**Histological Variations and MRI Features:**

**Oedema:** Oedema was present in 61(93.8%) cases as shown in table 3 of which 10(15.3%) cases had marked oedema, 35(53.8%) cases had moderate oedema and 16(24.6%) cases had mild oedema. Out of the total 51 cases of classical variant 49(75.3%) had oedema and out of 12 cases of desmoplastic variant 10(15.3%) cases had oedema. Both the two cases on anaplastic variant presented with marked oedema.

**Margin:** Margin was well defined in 57(87.6%) cases and poorly defined in 8(12.3%) cases. In the classical variant 47(72.3%) cases had well defined margin and 4(6.15%) cases had poorly defined margin. While of 12 desmoplastic variant 10(15.3%) cases had well defined margin and 2(3.07%) had poorly defined margin. Two cases of anaplastic variant had poorly defined margin.

**Hydrocephalous:** In our study of the total 65 cases 54(83.07%) cases had hydrocephalous of which 45(69.2%) cases belong to classical variant,7(10.7%) cases belong to desmoplastic and 2(3.07%) belong to anaplastic variant.

**Haemorrhage and Necrosis:** Haemorrhage was seen in 4(6.1%) cases of desmoplastic and 2(3.07%) cases of anaplastic variant. Necrosis was seen in 4(6.1%) cases of desmoplastic and 2(3.07%) cases of anaplastic variant.

Table 3 Histological variants and MRI features

Histologic al type	Oedema	Margin		Hydrocephalous	Haemorrhage	Necrosis
		Well defined	Poorly defined			
Classical	49(75.3%)	47(72.3%)	4(6.15%)	45(69.2%)	0	0
Desmopla stic	10(15.3%)	10(15.3%)	2(3.07%)	7(10.7%)	4(6.15%)	4(6.15%)
Anaplastic	2(3.07%)	0	2(3.07%)	2(3.07%)	2(3.07%)	2(3.07%)
Large cell	0	0	0	0	0	0
MBEN	0	0	0	0	0	0



### Histological Variations and CSF diversion and their level of Surgical Excision:

In our study as shown in table 4 of the total 65 cases 54(83.07%) had hydrocephalous and 51(78.4%) required MPVP shunt. In two cases EVD was given because of poor GCS followed by MPVP shunt placement.

All patients underwent surgical excision followed by radiotherapy. Chemotherapy was given to four cases with high

grade tumour.

Gross total excision was done in 51(78.46%) cases and near total was done in 14(21.5%) cases. Out of the 14 near total excision cases 8 had extension to the brain stem. CSF collected by lumbar puncture 2 weeks following surgery had not detected any malignant cells in any patients of our series. Post-operative MRI brain showed residual tumour volume more than 1.5 cm<sup>2</sup> in 14 (21.5%) patients.

**Table 4** Surgical Treatment

Histological Types	MPVP shunt	Gross Excision	Total	Near Excision	Total	Subtotal Excision
Classical	42(64.61%)	41(63.07%)		10(15.3%)		0
Desmoplastic	7(10.7%)	10(15.3%)		2(3.07%)		0
Anaplastic	2(3.07%)	0		2(3.07%)		0
Large cell	0	0		0		0
MBEN	0	0		0		0

**Post-operative complications:** One patient who presented with poor GCS preoperatively expired 36 hours after surgery. Cerebellar ataxia was seen in 10(15.3%) cases and nystagmus in 10(15.3%) cases. Cerebellar mutism was seen in 4(6.15%) cases. Cranial nerve palsy (abducen and facial) was seen in 3(4.6%) cases. Recurrence was noted at 1 year follow up in 6 cases of which two cases did not complete their radiotherapy cycles.

**Follow up:** Follow was done at 1 month, 3 month, 6 month, 9 month and 1 year. Recurrence was seen in 6 cases of which 4 were of classical type and 2 anaplastic type. All 6 cases had near total excision and two of them did not complete their radiotherapy cycles.

### DISCUSSION

In our study majority of the cases belonged to the paediatric age group with only 4.6% cases above the age of 15 years. 64.6% cases belonged to the age group 5-15 years, 16.9% cases in 3-5 years group and 13.8% cases in 0-3 years group. Majority of cases in our study were male comprising 61.5% and female 38.4% with male to female ratio 1.6:1. Similar findings were reported by Agerlin N, Gjerris F, Brinker H,<sup>11</sup> with 35.5% cases in 0-4 years and 64.4% cases between 5-14 years and a male to female ratio of 2:1. In our study all cases presented with headache, vomiting was seen in 51(78.4%) cases. Anorexia with weight loss was seen in 21(32.3%) cases and lethargy in 20(30.7%) cases. Imbalance was seen in 43(66.1%) cases, papilledema was seen in 22(33.8%) and decreased vision in 16(24.6%) cases. Truncal ataxia was seen in 29(44.6%) cases and appendicular ataxia in 8(12.3%) cases. Alston RD in 2003,<sup>12</sup> have reported that the older child is more likely to present pressure features of headache, vomiting, and ophthalmic signs. Younger children present with non-specific features such as lethargy, behavioral disturbance, or increasing head size. Ataxia is seen in about 75% of children across the age range.

In our study classical variant was the most common type with 51(78.4%) cases and most belong to 5-15 years with 32(49.2%) cases. Desmoplastic variant comprised 12(18.4%) cases and was seen in older age group. Anaplastic variant comprised 2 cases. Of 51 classical types, 33(50.7%) cases were male and 18(27.6%) cases were female. Of 12 desmoplastic type 7(10.7%) were male and 5(7.6%) were female. Both the two cases of anaplastic variant were female. According to different literatures the age distribution of desmoplastic variety is still disputed. Mc Manamy CS, Pears J, Weston CL,<sup>13</sup> found classical variant in 71% cases, desmoplastic in 16% cases and anaplastic in 17% cases.

In our study of the classical variants 49(75.3%) were vermin, in the Desmoplastic variety 7(10.7%) were paravermian and 5(7.6%) were lateral in location. Two anaplastic variant were paravermian in location. Bourgouin PM,<sup>14</sup> Hubbard JL,<sup>15</sup> have reported that vermin medulloblastoma are mostly appearing as a hyper-dense mass on plain CT, and with intense homogenous enhancements with contrast. Lateral lesion is more common in older age group which appears as mixed density lesion on plain CT, and with heterogenous enhancements with contrast.

Most of the classical variant showed T1 hypointensity and T2 hyperintensity, while the desmoplastic group in T1 showed variable hypointensity and mostly is intensity in T2 MRI signal. Similar findings were reported by Bourgouin PM. Heterogeneity is more common in the older age group and it is more prominent in MRI than CT. According to them is signal intensity on T2 weighted images and more heterogeneity in older age group might be related to desmoplastic histology.

Oedema was present in 61(93.8%) cases of which 10(15.3%) cases had marked oedema, 35(53.8%) cases had moderate oedema and 16(24.6%) cases had mild oedema. Margin was well defined in 57(87.6%) cases and poorly defined in 8(12.3%) cases. Of total 65 cases 54(83.07%) cases had hydrocephalous of which



45(69.2%) cases belong to classical variant, 7(10.7%) cases belong to desmoplastic and 2(3.07%) belong to anaplastic variant. Hemorrhage was seen in 4(6.1%) cases of desmoplastic and 2(3.07%) cases of anaplastic variant. Necrosis was seen in 4(6.1%) cases of desmoplastic and 2(3.07%) cases of anaplastic variant. Sandhu A,<sup>16</sup> had reported oedema in 90% cases and marked oedema in 1% cases; they had not reported any specific age/site distribution in their series. Bourgouin PM had reported that the vermian lesions had well defined margins and in lateral lesions had poorly defined margins. In the same study of Sandhu, they have reported haemorrhage in 1% cases only in adults.

In our study of the total 65 cases 54(83.07%) had hydrocephalous and 51(78.4%) required MPVP shunt. Gross total excision was done in 51(78.46%) cases and near total was done in 14(21.5%) cases. Out of the 14 near total excision cases 8 had extension to the brain stem. Post operatively cerebellar ataxia was seen in 10(15.3%) cases and nystagmus in 10(15.3%) cases. Cerebellar mutism was seen in 4(6.15%) cases. Cranial nerve palsy (abducen and facial) was seen in 3(4.6%) cases. Recurrence was noted in 6 cases of which two cases did not complete their radiotherapy cycles.

## CONCLUSION

Our study indicates that medulloblastoma is commonly seen in paediatric age group and more common in males. Within the paediatric age group certain variants appear in younger group while others in older group. Patients usually presents with features of raised ICP, imbalance and visual disturbance. Classical variant was the most common type with mostly vermian location followed by desmoplastic variant which was paravermian to lateral in location. CT and MRI features varied in different variants of medulloblastoma. In most of the cases gross total excision was possible and surgical outcome is favourable. Post operatively radiotherapy and chemotherapy have proved very useful. Recurrence was seen to be associated with level of surgical excision and post-operative radiotherapy and chemotherapy.

**Conflict of interest:** There was no conflict of interest in the study.

**Ethical clearance:** Required ethical clearance was obtained.

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**Authors contributions:** All the authors of the study have contributed together to carry out the study and it does not infringe any copyright or violate any other right of any third parties. The article has not been published (whole or in part) elsewhere, and is not being considered for publication elsewhere in any form. All authors have contributed sufficiently in the article to take public responsibility for it and all authors have reviewed the final version of the above manuscript and approve it for publication.

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## ORIGINAL PAPER

# A study of serum zinc in depression

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## ABSTRACT

**Introduction:** Depression, a mood disorder is a common mental health problem in all sections of people of the society, and it causes physical, psychological and social symptoms. So, keeping this in mind, the study is carried out to estimate serum zinc in cases of depression and compare the levels with that of age and sex matched healthy controls. **Aim:** To measure the serum zinc in clinically diagnosed patients with depression and study their levels in different age groups and gender. **Methods:** serum zinc estimation is done by colorimetric method. Serum albumin estimation is done by Bromocresol Green (BCG) method. **Results:** Serum zinc was significantly ( $p < 0.01$ ) lower in the cases ( $58.55 \pm 8.70 \mu\text{g/dl}$ ) than in the controls ( $64.78 \pm 9.86 \mu\text{g/dl}$ ). **Conclusion:** It is suggestive that Serum zinc levels being lower in cases of depression; may have a role on the causation or be a result of depression. So, longer duration of study and with a larger sample size may reveal significant insights on the role of this micronutrient in depression.

**Keywords:** Psychiatry, Assam, micronutrient

## INTRODUCTION

Depression, the common psychological disorder, affects about 121 million people worldwide. World Health Organization (WHO) states that depression is the leading cause of disability as measured by Years Lived with Disability (YLDs) and the fourth leading contributor to the global burden of disease. By the year 2020, depression is projected to reach second place in the ranking of Disability Adjusted Life Years (DALY) calculated for all ages. Today, depression already is the second cause of DALYs in the age category 15-44 years.<sup>1</sup>

It is estimated that depression is the cause of 50-70% suicides.<sup>2</sup> There are some evidences that depression is accompanied by activation of the Inflammatory Response System (IRS). Increased numbers of leucocytes, monocytes, neutrophils, activated T-lymphocytes and secretion of neopterin and prostaglandins.<sup>3</sup> An Acute Phase (AP) response is indicated by changes in serum acute phase proteins<sup>4</sup> and increased secretion of

proinflammatory cytokines, such as interleukin-1b (IL-1b), IL-6 and interferon-g (IFN-g). Since these proinflammatory cytokines induce IRS activation, the above changes in depression may be caused by increased production of IL-1b, IL-6, and IFN-g.<sup>4</sup> IRS activation is associated with decreasing in serum zinc. There is now evidence that depression is accompanied by lower serum zinc.<sup>4</sup> IRS activation results in decreased serum albumin concentration and availability of less zinc (Zn) binding protein.<sup>5</sup> However, it is not known whether the decrease in serum zinc in depression is attributable to lower serum albumin.

Zinc is an antagonist of the glutamate/N-methyl-D-aspartate (NMDA) receptor and exhibits antidepressant like activity in rodent tests/models of depression. This preliminary clinical study demonstrated the benefits of zinc supplementation in antidepressant therapy.<sup>6</sup> All the above data indicate the important role of zinc homeostasis in the psychopathology and therapy of depression and potential clinical antidepressant activity of this ion.

The present study aims to measure the serum Zinc in clinically diagnosed patients with depression and study their levels in different age groups and gender.

## METHODS

The present study comprised of 50 cases of depression and 50 age and sex matched healthy controls visiting the Department of Psychiatry, Assam Medical College, Dibrugarh, Assam. Inclusion Criteria: Patients of age group 16 to 50 years, newly diagnosed

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cases of depression as diagnosed by DSM IV and previously diagnosed cases of depression in which patient is drug free for atleast one month. Exclusion Criteria: Patients with other associated psychiatric disorders and dementia, Substance abuse, systemic illness like diabetes, hypertension, hypothyroidism, renal disease, liverdisease, obesity and cancer, pregnant ladies and lactatingmothers, patients on multivitamins and oral contraceptive pills(OCP) and patients with mental retardation and hearingimpairment. The Grading of the cases included in the present study into mild/moderate/severe was done using the 17 item Hamilton Depression Rating Scale.

METHODS

ESTIMATION OF SERUM ZINC (colorimetric method)<sup>7,8</sup>

Zinc in an alkaline medium reacts with Nitro-PAPS to form a purple coloured complex. Intensity of the complex formed is directly proportional to the amount of zinc present in the sample.

Alkaline medium

Zinc + Nitro-PAPS → Purple coloured complex.

ESTIMATION OF SERUM ALBUMIN {BROMOCRESOL GREEN (BCG) METHOD}<sup>9</sup>

Principle: Albumin binds with the dye Bromocresol Green in a buffered medium to form a green coloured complex. The intensity of the colour formed is directly proportional to the amount of albumin present in the sample.

Albumin + Bromocresol Green → Green Albumin BCG Complex

Apart from unpaired student’s test, ANOVA, Regression Analysis was the statistical tools applied.

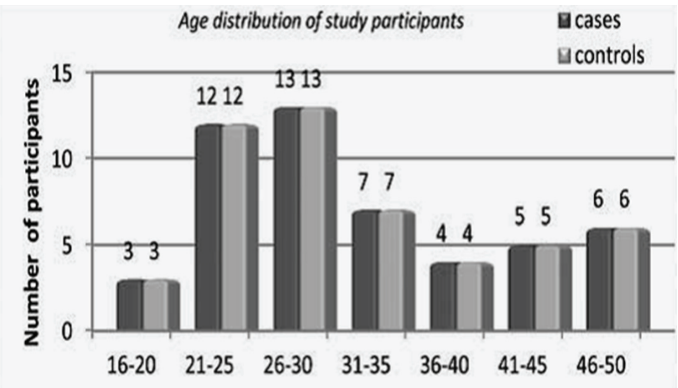


Figure 1 Age distribution of cases

Table1 Comparison in cases and controls

	Cases		Controls		
Parameters	Mean	SD	Mean	SD	P-Value
Serum Zinc(µg/dl)	58.55	8.70	64.78	9.86	<0.01*
Serum Albumin(g/dl)	3.70	0.41	3.85	0.46	>0.05

\*-Statistically significant

Serum Zinc in cases (58.5 ± 8.70 ig/dl) was significantly lower (p<0.01) than in the controls (64.78± 9.86 ig/dl). Serum albumin

Highest number of depression cases included in the study were in the 26-30 years age group (26%), followed by 21-25 years age group (24%).16-20 years age group with only 3 cases showed the lowest number of cases i.e., 6%.

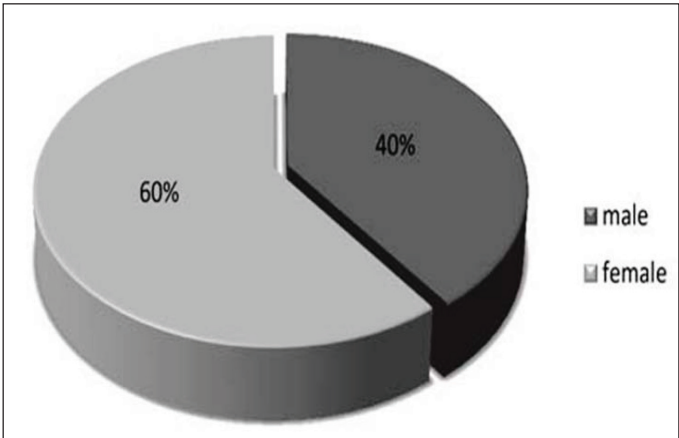


Figure 2 Gender distributions of cases

The diagram shows that majority of the cases in the present study were females. 40% of cases were males and 60% of the cases were females with a male female ratio of 0.67:1.

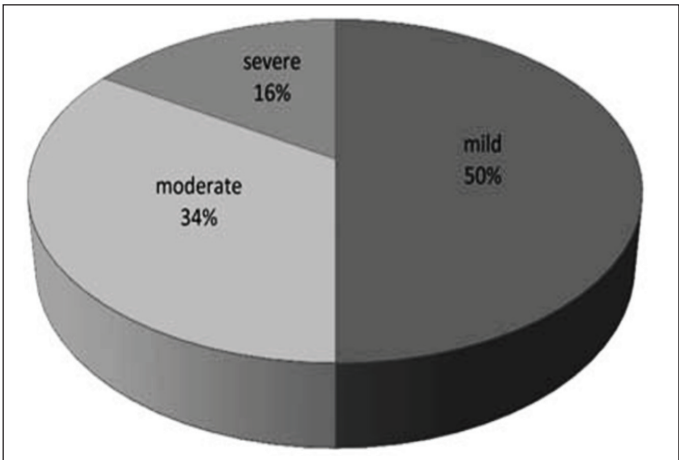


Figure 3 Different grades of depression

In the diagram, it is seen that mild depression constitutes the majority of the cases under study. 25 cases (50%) of total cases were mild depression, 17 cases (34%) were moderate depression and 8 cases (16%) were severe depression.

was also lower in the cases (3.70± 0.41g/dl) than in the controls (3.85± 0.46 g/dl) but not statistically significant.



Serum Zinc in cases ( $58.5 \pm 8.70$   $\mu\text{g/dl}$ ) was significantly lower ( $p < 0.01$ ) than in the controls ( $64.78 \pm 9.86$   $\mu\text{g/dl}$ ). Serum albumin

was also lower in the cases ( $3.70 \pm 0.41$   $\text{g/dl}$ ) than in the controls ( $3.85 \pm 0.46$   $\text{g/dl}$ ) but not statistically significant.

**Table 2** Comparison in male and female cases

PARAMETERS	Cases			Controls		
		MEAN	S.D	MEAN	S.D	P VALUE
SERUM ZINC( $\mu\text{g/dl}$ )	MALE	56.0	6.99	66.65	9.05	<0.01*
	FEMALE	60.25	9.40	63.54	10.32	NS

\*= Statistically significant; NS= Not Significant( $p > 0.05$ )

From the above table, it is observed that serum zinc in male and female cases were respectively lower than in the male and female

controls. However, serum zinc ( $56.0 \pm 6.99$   $\mu\text{g/dl}$  vs.  $66.65 \pm 9.05$   $\mu\text{g/dl}$ ) in the males was statistically significant ( $p < 0.01$ ).

**Table 3** Comparison on basis of different grades of depression in cases and controls

		Mild	Moderate	Severe
		MEAN $\pm$ S.D	MEAN $\pm$ S.D	MEAN $\pm$ S.D
Serum zinc( $\mu\text{g/dl}$ )	CASES	57.94 $\pm$ 8.95	58.94 $\pm$ 6.78	59.61 $\pm$ 12.10
	CONTROL	63.05 $\pm$ 10.0	65.77 $\pm$ 10.62	68.12 $\pm$ 9.08
	P value	NS	<0.05*	NS

\*= Statistically significant; NS= Not Significant( $p > 0.05$ )

In the above table, it is observed that serum zinc is lower in cases compared to the controls in all categories of depression cases and it is significantly lower in the moderate depression cases.

**Table 4** Correlation of serum zinc and albumin with Hamilton Score in the cases

PARAMETER	r- value	p-value
Serum zinc	0.097	NS
Serum Albumin	0.154	NS

NS –not significant

From the above table, it is observed that both serum albumin and serum zinc shows a positive correlation with the severity of depression.

**Table 5** Correlation of serum zinc with serum albumin in the cases

Zinc	Albumin	
	r value	p value
	0.210	NS

NS-not significant

In the table, it is observed that serum zinc and serum albumin shows a positive correlation, but it was not significant statistically.

## DISCUSSION

The analysis of serum zinc in the study participants, showed that serum zinc was found to be significantly lower ( $p < 0.001$ ) in the depressed study participants ( $58.55 \pm 8.70$   $\mu\text{g/dl}$ ) than in the healthy controls ( $64.78 \pm 9.86$   $\mu\text{g/dl}$ ). Siwek M et al also found significantly lower (by 22%) serum zinc level in depressed patients than in healthy volunteers.<sup>10</sup> Salimi et al in an Iranian population of 144 depressed patients and 161 age and sex matched healthy controls found significantly lower levels of zinc depressed patients.<sup>11</sup> Mousavi et al, in a study

in 46 depressed patients, found the serum concentration of zinc was about half of normal value and the difference was statistically significant ( $p = 0.02$ ) between depressed patients and controls.<sup>12</sup>

Amani R et al found a linear significant correlation between dietary zinc intakes and its serum levels in samples ( $r = 0.62$ ;  $p < 0.001$ ) and Major depressive disorder (MDD) students ( $r = 0.55$ ;  $p < 0.001$ ).<sup>13</sup> Maes et al found that Serum Zinc (Zn) and Albumin were significantly lower in major depressed patients than in normal volunteers. In healthy volunteers and major depressed patients, there were significant and positive correlations between serum Zinc and Albumin.<sup>14</sup>

Roosbeh Jamshid et al,<sup>15</sup> Maes et al,<sup>4</sup> Mc Loughlin et al<sup>16</sup> also found lower values of serum zinc in depression. Thus, the findings of serum zinc in the present study are consistent with the findings of all the above researchers.

On gender wise analysis, serum zinc was found to be lower in the depressed study participants than in the healthy controls in both the genders, and it was statistically significant in the males ( $p < 0.001$ ). When compared with healthy controls, serum Zinc was found to be significant ( $P < 0.05$ ) in the moderately depressed cases ( $58.94 \pm 6.78$   $\mu\text{g/dl}$  vs.  $65.77 \pm 10.62$   $\mu\text{g/dl}$ ), whereas it was not significant ( $p > 0.05$ ) in the mild ( $57.94 \pm 8.95$   $\mu\text{g/dl}$  vs.  $63.05 \pm 10$   $\mu\text{g/dl}$ ) and in the severe depression cases ( $59.61 \pm 12.1$   $\mu\text{g/dl}$  vs.  $68.12 \pm 9.08$   $\mu\text{g/dl}$ ).

Serum zinc did not show any statistically significant difference ( $p > 0.05$ ) when analysed in the different grades of depression. Zinc showed the lowest values in the mild cases ( $57.94 \pm 8.95$   $\mu\text{g/dl}$ ), followed by moderate ( $58.94 \pm 6.78$   $\mu\text{g/dl}$ ) and severe cases ( $59.61 \pm 12.1$   $\mu\text{g/dl}$ ) respectively.

The lower zinc level observed in depression could be caused by three different reasons. First, by nutritional deficiencies: primary, inducing the development of depressive symptoms or secondary to depression, resulting from the reduced

appetite, the typical picture of the disease. Patients suffering from depression tend to have lower levels of zinc in the blood than healthy subjects.<sup>10</sup> In a study by Griever et al an association was found between serum zinc and higher degrees of depression and also a poor nutritional status measured with the Mini Nutritional Assessment in geriatric long term care residents.<sup>17</sup>

Second, an explanation for the reduction in the level of zinc in the blood of depressed patients could be hyper stimulation of the hypothalamic- pituitary-adrenal (HPA) axis, and the associated hypercortisolism. A third and more convincing concept is that, a lower zinc level is the result of inflammation and acute phase response and is associated with oxidative stress.<sup>10</sup>

The low serum zinc as found in the present study can be attributed to low levels of the binding protein, albumin. Maes et al<sup>14</sup> suggested that major depression is accompanied by activation of the inflammatory response system (IRS). Other signs of IRS activation, which have been reported in major depression, are lowered serum zinc and serum albumin concentrations. In serum, zinc is closely bound to albumin. The results of that study suggest that lower serum zinc in depression is in part explained by lowered serum albumin and by another depression-related mechanism. It is suggested that lower serum Zinc in depression may be secondary to sequestration of metallothionein in the liver, which may be related to increased production of interleukin-6.<sup>14</sup> Decreased food intake may also be a contributing fact to low albumin and zinc in depression.

## CONCLUSION

From the present study, it was observed that serum zinc was significantly lower in patients with depression as compared to age and sex matched healthy controls. The decrease in serum zinc showed no significant correlation with the severity of depression. In the study, serum zinc was found to have a positive correlation with serum albumin. Zinc appears to have a significant role in depression. If zinc supplementation could lower the effective doses of antidepressants, then some unwanted side effects of such drugs could be decreased. However, there is need for more studies on this subject with larger sample sizes, taking care of all variables and in completely newly diagnosed patient group to peer deep into the problem so as to enable to explore unforeseen areas encompassing this disease syndrome.

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## ORIGINAL PAPER

# Prevalence and antibiogram of uropathogens in a tertiary care hospital in Manipur, India

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## ABSTRACT

**Introduction:** Due to high variability of resistance patterns which vary even over short periods of time, periodic evaluation of such activity is essential. **Aim:** To document the prevalence, antibiotic susceptibility and resistance patterns of uropathogens in the area to ensure appropriate therapy. **Methods:** This is a cross sectional study on 5108 urine samples from June 2014 to May 2015. Antibiotic susceptibility testing was done by Kirby- Bauer disc diffusion method and compared. Gram positive cocci and Gram negative bacilli detected were further subjected to detection of Methicillin resistant *Staphylococcus aureus* (MRSA) by Cefoxitin disc diffusion tests and detection of Extended Spectrum Beta lactamases (ESBL) by ESBL screening test and confirmed by combined disc diffusion test (CDT). **Results:** Out of 5108 samples subjected to bacterial culture, 2940 (57.56%) showed positive growth out of which *Escherichia coli*, 1300 (44.2%) was the most common organism isolated followed by *Staphylococcus aureus* 914 (31%), *Klebsiella pneumoniae* 362 (12.3%), *Enterococcus* 172 (5.85%), *Acinetobacter* 80 (2.72%), *Pseudomonas* 72 (2.44%), *Proteus* 40 (0.81%), and *Staphylococcus saprophyticus* 16 (0.54%). On further evaluation, 1026 (56.06%) isolates of Gram negative bacilli (GNB) family showed presence of ESBL and 722 (78.99%) isolates of *Staphylococcus aureus* were positive for (MRSA) tests. **Conclusion:** Continual surveillance is required to detect changes in prevalence rates of different uropathogens. Increased prevalence of *Acinetobacter* was detected in our study. Monitoring of MRSA, ESBL production and antimicrobial susceptibility testing (AST) is necessary to avoid treatment failure and development of further resistance in patients with UTI.

**Keywords:** Urinary tract infection, *Acinetobacter*

## INTRODUCTION

Despite the widespread availability of antibiotics, urinary tract infections (UTIs) represent one of the most common diseases encountered in medical practice today, with an estimated 150 million UTIs per annum worldwide with a lifetime risk greater than 50% in females.<sup>1,2</sup> More than 95% of UTIs are caused by a single species out of which *Escherichia coli* was the most frequently associated bacteria in both the community and hospital acquired cases.<sup>3</sup> Other Gram negative bacteria isolated includes *Klebsiella*, *Proteus*, *Pseudomonas* and *Enterobacter*. Gram positive bacteria account for 5 to 10% of UTIs and include *Staphylococci*, *Streptococci* and *Enterococci*.<sup>4</sup>

Pathogenic organisms show highly variable patterns of resistance over short durations depending on different regions and sites of isolation of the organisms.<sup>5</sup> The present study was carried out to generate and update this information.

## METHODS

5108 consecutive urine samples were studied from both outpatients and inpatients of all age groups irrespective of sex, religion and socio-economic status with symptoms suggestive of UTI. It was a prospective study done for a 1 year period from June 2015-May 2016 with approval from the Institutional Ethics Committee.

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Samples were collected and processed immediately.<sup>6</sup> Samples with significant pyuria were subjected to culture by semi-quantitative method.<sup>7</sup> Significant bacteriuria were determined and organisms were identified by their colony morphology, Gram stain and biochemical reactions adopting standard methodology.<sup>8</sup> Antibiotic susceptibility testing (AST) was done as per CLSI recommendations.<sup>9</sup>

All isolates of *S. aureus* were tested for presence of Methicillin Resistant *S. aureus* (MRSA) strain by cefoxitin disc diffusion method. A standard strain of Methicillin sensitive *Staphylococcus aureus* (MSSA) ATCC 29213 was used as control strain.<sup>10</sup>

All Gram negative bacilli were further subjected to detection of Extended spectrum Beta-lactamases (ESBL) by CLSI recommended ESBL screening test.<sup>9</sup> Potential ESBL isolates were then put up for Combined disk test (CDT) for confirmation.<sup>11</sup>

## RESULTS

Of the 5108 consecutive urine samples, 3356 were found to contain significant bacteriuria and were included in the study of which 2940 showed positive growth, 384 showed insignificant growth and 32 were declared contaminated due to growth of more than two organisms seen after overnight incubation at 37°C. Out of 2940 positive growth samples, 971 (33.02%) belonged to IPD (In Patient Department) and 1969(66.97%) to OPD (Out Patient Department). Among the IPD patients, maximum urine samples were received from Gynaecology and Obstetrics Department followed by Surgery

and Medicine along with their Allied Departments respectively.

Out of a total of 2940 urine samples showing positive growth, 2323(79.01%) samples were from females, thus showing a female predominance, of which the highest isolation rate was found in the (21-30) years age group with 775 samples showing positive growth, thus revealing the increased vulnerability of the reproductive age group to UTIs. Amongst the males, maximum samples with positive growth were seen in patients in the age group of 61-70 years old. The male: female ratio is 1:3.8.

**Table 1** shows the distribution of bacterial isolates with *Escherichia coli*, 1300(44.2%) being the most common organism isolated irrespective of gender or age group followed by *Staphylococcus aureus* 914(31%), *Klebsiella pneumonia* 362(12.3%), *Enterococcus* 172(5.85%), *Acinetobacter* 80(2.72%), *Pseudomonas* 72 (2.44%), *Proteus* 40(0.81%), and *Staphylococcus saprophyticus* 16(0.54%).

**Table 1** Gender wise distribution of bacterial isolates

Organisms	Male	Female	Total (%)
<i>Escherichia coli</i>	339	961	1300 (44.2%)
<i>Staphylococcus aureus</i>	82	832	914 (31%)
<i>Klebsiella pneumonia</i>	68	294	362 (12.3%)
<i>Enterococcus</i>	44	128	172 (5.85%)
<i>Acinetobacter</i>	24	16	80 (2.72%)
<i>Pseudomonas</i>	44	68	72 (2.44%)
<i>Proteus</i>	12	12	24 (0.81%)
<i>Staphylococcus saprophyticus</i>	4	12	16 (0.54%)
TOTAL	617	2323	2940 (100%)

**Table 2** Drugs sensitivity pattern of Gram Negative Bacilli

Antibiotic	<i>Escherichia coli</i> ,n(%)	<i>Klebsiella pneumoniae</i> , n (%)	<i>Proteus</i> ,n(%)	<i>Acinetobacter</i> , n(%)	<i>Pseudomonas aeruginosa</i> ,n(%)
Ceftazidime(30µg)	483(37.15%)	148(40.88%)	20(83.33%)	60(75%)	42(58.33%)
Cefotaxime(30µg)	459(35.30%)	145(40.05%)	19(79.16%)	54(67.5%)	41(56.94%)
Ceftriaxone(30µg)	442(34%)	143(39.50%)	19(79.16%)	52(65%)	41(56.94%)
Cefpodoxime(10µg)	445(34.23%)	147(40.60%)	18(75%)	52(65%)	39(54.16%)
Aztreonam(30µg)	518(39.84%)	153(42.26%)	20(83.33%)	53(66.25%)	42(58.33%)
Ceftazidime + Clavulanate(30/10µg)	794(61.07%)	255(70.44%)	21(87.5%)	54(67.5%)	44(61.11%)
Imipenem(10µg)	1300(100%)	304(83.97%)	22(91.66%)	64(80%)	66(91.66%)
Nitrofurantoin(300µg)	1139(87.61%)	293(80.93%)	11(45.83%)	ND*	ND*
Norfloxacin(10µg)	640(49.23%)	181(50%)	18(75%)	ND*	39(54.16%)
Gentamicin(10µg)	1042(80.15%)	362(100%)	11(45.83%)	31(38.75%)	29(40.27%)
Ciprofloxacin(10µg)	ND*	ND*	ND*	35(43.75%)	53(73.61%)
Ampicillin(10µg)	ND*	ND*	ND*	31(38.75%)	ND*
Piperacillin + Tazobactam(30/10µg)	1189(91.46%)	341(94.19%)	24(100%)	69(95.83%)	64(88.88%)
Amikacin(30µg)	1105(85%)	328(90.60%)	24(100%)	36(45%)	65(90.27%)

\*Not Done

On the other hand, Gram positive bacteria included in the study showed maximum sensitivity with Vancomycin and Linezolid for *Staphylococcus aureus*, Linezolid for *Enterococcus* and

Nitrofurantoin, Linezolid and Vancomycin for *Staphylococcus saprophyticus*.

**Table 3** Antibiotic sensitivity of Gram Positive Bacteria

Antibiotics	S. aureus	Enterococcus	S. saprophyticus
Norfloxacin(10µg)	65(7.11%)	112(65.11%)	10 (62.5%)
Nitrofurantoin(300µg)	716(78.33%)	155(90.11%)	16(100%)
Ampicillin(10µg)	114(12.47%)	14(8.13%)	8(50%)
Cotrimoxazole(25µg)	365(39.93%)	ND*	7(43.75%)
Cefoxitin(30µg)	173(18.92%)	ND*	ND*
Clindamycin(2µg)	498(54.48%)	ND*	11(68.75%)
Vancomycin(30µg)	914(100%)	164(95.34%)	16(100%)
Gentamycin(10µg)	724(79.21%)	ND*	13(81.25%)
Gentamycin(120µg)	ND*	130(75.58%)	ND*
Linezolid(30µg)	914(100%)	170(98.83%)	16(100%)
Fosfomycin(50µg)	712(77.89%)	130(75.58%)	13(81.25%)
Ciprofloxacin(5µg)	372(40.70%)	24(13.95%)	7(43.75%)

\*Not Done

Out of 914 staphylococcus aureus isolated, 722(78.99%) showed resistance to cefoxitin and were, therefore, positive for the detection of methicillin resistant staphylococcus aureus (MRSA) strain.

All enterobacteriaceae isolates were subjected to ESBL screening

picture but with a few exceptions.<sup>14</sup>

Escherichia coli (44.2%) was the most common organism identified in our study as observed in other studies from other parts of India and also from different countries across the world such as Israel, Iran, Kuwait, Nigeria, Britain and USA.<sup>15</sup>

**Table 4** Results for ESBL screening and confirmatory test

Organism	No of organism isolated (n)	ESBL results	
		Screening,n(%)	CDT,n(%)
Escherichia coli	1300	913	768(59.07%)
Klebsiella pneumoniae	362	247	206(56.90%)
Proteus	24	10	3(12.5%)
Acinetobacter	72	32	15(20.83%)
Pseudomonas	80	46	34(42.5%)
TOTAL	1830	1407	1026(56.06%)

and confirmatory test by combined disc test (CDT). Out of a total of 1830 Gram negative bacilli, 1407 isolates were positive in the ESBL screening test and 1026(56.06%) isolates were confirmed positive by combined disc test.

## DISCUSSION

UTI is emerging as an important bacterial infection both in the community as well as amongst hospital acquired infections.<sup>12</sup> It is documented to be more common in females; our study is rightly in agreement with this generalization. This can be attributed to the fact that females become more susceptible to UTIs after the age of 6 months due to their shorter urethra thus providing easy access of bacteria to the bladder.<sup>13</sup>

This study was done to generate data on the etiologic agents causing UTI and their AST patterns in relation to different factors such as age and gender in the region. By using this database, we have made an attempt to define the population that is most amenable to empirical therapy. However, it is to be noted that the safety and efficacy of such empirical therapy depends upon periodic assessment of antimicrobial resistance profiles.

A comparison of the results of our study with the resistance rates previously published in this region showed a broadly similar

Due to their widespread indiscriminate use, easy availability, and over the counter sale, drug resistance among uropathogens has increased over the past few decades which are heading us toward the use of higher spectrum antibiotics. Hence, the magnitude of this problem should be assessed properly in an accurate way.<sup>16</sup>

In the present study, maximum isolates of Escherichia coli were sensitive to Imipenem. Among the Enterobacteriaceae, majority of the isolates have shown high resistance to cephalosporin which was once a commonly used drug for UTI but, this broad spectrum molecule has almost entirely lost its efficacy due to lack of rational use.<sup>17</sup> Amongst all antimicrobials used, nitrofurantoin was found to be a reasonably efficacious agent against almost all uropathogens in our study and similar results were also reported from other studies.<sup>18</sup>

Amongst the gram positive organism, the most common organism isolated was Staphylococcus aureus which showed maximum sensitivity to vancomycin and linezolid. This is in concordance with other studies.<sup>19</sup>

In the present study, maximum numbers of non-fermenters were reported from Acinetobacter species followed by Pseudomonas species which is in contrast with other studies showing Pseudomonas as the leading non-fermenting bacteria. Most of

the *Acinetobacter* cases were isolated in the months of June and July correlating with the fact that *Acinetobacter* shows increased prevalence during hot and humid climates. Further evaluation was done to determine the factors associated with this recent increase in *Acinetobacter* species in our institute. It was noted that, at the time of infection, 46 patients were from various ICUs, 23 patients were from medicine wards and 11 patients were from surgery wards. The high incidence seen in the ICUs leads us to suspect the possibility that a minor epidemic might have occurred during these months. Out of a total of 23 patients from medicine wards, 16 patients were HIV positive and were on ART treatment and 3 patients were diabetic. Of the 11 patients from surgery wards, 5 patients had urinary catheters and 1 patient was on mechanical ventilation after a prior surgery. All of these factors hint at an increased prevalence of *Acinetobacter* infection in an immuno compromised host. Another important contributing factor is irregular infection control practices at present in the institute as ours is primarily a new medical college and Hospital Infection Control Committee (HICC) though established is not fully functional.<sup>20</sup>

Conventional antimicrobials are usually ineffective against *Pseudomonas* infections. In our study, it showed maximum sensitivity to Imipenem. In the recent years, carbapenems are being used widely for *Pseudomonas* infections; we recommend that its use should be restricted to special circumstances in order to preserve its long term efficacy.<sup>21</sup>

The overall MRSA prevalence in our study was 78.99% which is comparable to a study done in the area.<sup>24</sup> In our study, MRSA detection was done by Cefoxitin Disk test as cefoxitin disk diffusion zones are much easier to read compared to oxacillin disk which gives hazy zones frequently and can be commonly misinterpreted. Also, oxacillin should be read using transmitted light, unlike cefoxitin, to ensure correct interpretation.<sup>25</sup>

ESBL production, Amp C production, reflux mechanism and porin deficiency are the different mechanisms of drug resistance in GNB among which ESBL production is the most common. In our study, 56.06% of gram negative bacilli were ESBL producers, which is in contrast with studies of Rekha *et al.* (30%) but is comparable to Anup Saha *et al.*<sup>21, 22</sup>

We appreciate some shortcomings of our work as it lacks clinical information. This study was based on laboratory data only so we failed to provide information on categorization of UTI patients into symptomatic or asymptomatic and complicated or uncomplicated.

## CONCLUSION

Although the etiologic pathogens of UTI remain same over the years, their prevalence and resistance rates through different mechanisms such as MRSA and ESBL production are ever changing as in the case of *Acinetobacter* in our study. Therefore continuous monitoring is critical to generate local population specific data to choose appropriate empiric pharmacotherapy for UTI.

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## ORIGINAL PAPER

# A study on lymphoid follicles of appendix

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### ABSTRACT

**Introduction:** Appendix is well recognized as an immunologic organ that actively participates in the secretion of immunoglobulins, particularly immunoglobulin A (IgA). The appendix is an integral component of the gut associated lymphoid tissue (GALT) system. Obstruction of the lumen is the dominating factor in acute appendicitis. **Methods:** The present study was undertaken at Gauhati Medical College & Hospital involving the departments of Anatomy and Forensic Medicine. Specimens of appendix were taken from the department of Forensic Medicine before putrefaction of the body. Specimens were collected after due permission/consent from the concerned authority and also from the nearest relatives of the deceased. Appendixes were studied in two age groups as '0 to 14 years', and '20 to 50 years'. The data recorded was analysed statistically using Student's T-test. P value  $< 0.05$  is considered as statistically significant. **Result:** The average number of the lymphoid follicle of appendix in the age group of '0 to 14' years is  $11.900 \pm 1.649$ . The average number of the lymphoid follicle of appendix in the age group of '20 to 50' years is  $7.636 \pm 0.855$ . The average diameter of the lymphoid follicle of appendix in the age group of '0 to 14' years is  $120.780 \pm 14.890 \mu\text{m}$ . The average diameter of the lymphoid follicle of appendix in the age group of '20 to 50' years is  $91.500 \pm 7.092 \mu\text{m}$ . **Conclusion:** number and diameter of lymphoid follicles of human appendix both increases upto adolescent period only. Afterwards, it decreases with advancement of age.

**Keywords:** Appendicitis, inflammation, age

### INTRODUCTION

The appendix is an evagination of the caecum characterized by a relatively small, narrow, and irregular lumen due to presence of abundant lymphoid follicles. It contains fewer and shorter intestinal glands and has no teniae coli. The vermiform appendix is located in the right lower quadrant of the abdomen.<sup>2,3</sup> The small entrance of the dead-end pocket of appendix makes it difficult to clean out and prone to physical blockage, which ultimately is the cause of appendicitis.<sup>4</sup> Similar to the tonsils, the lymphatic tissue in the appendix is typically in a constant state of chronic inflammation, and it is generally difficult to tell the

difference between pathological disease and the "normal" condition.<sup>5</sup> The incidence as per position of appendix has been reported as 65.28% for retrocaecal, 31.01% pelvic, 2.26% subcaecal, 1% preileal and 0.4% for right paracolic / postileal.<sup>6</sup> The most characteristic feature of the appendix, particularly in young, is the presence of masses of lymphoid tissue in mucosa and submucosa.<sup>7</sup> The commonest positions seen in clinical practice are retrocaecal or retro colic, pelvic or descending. Other positions are sub caecal, pre ilial and post ilial.<sup>8</sup> The appendix is commonly 8 to 10 cm in length (about 3½ inches), though cases upto 20 cm long or more have been reported. It was found that the average length of the appendix in 220 consecutive postmortem examinations to be 9.9 cm. It has been described as tending to be about a centimeter longer in the male than in the female, though some investigators have found no particular difference with sex; its average diameter is about 6 mm at its base.<sup>9</sup> The appendix is the commencement of the large gut. At an early embryonic stage it has the same caliber as the caecum and is in line with it. It is formed by the excessive growth of the right wall of the caecum which pushes the appendix to the inner side. The average length is 9 cm.<sup>10</sup> According to some author the length of the appendix varies from 2 to 20 cm & the average length is 9 cm in adults.<sup>11</sup> Histologically appendix presents four coats from outside inwards: serous, muscular, submucous and mucous.<sup>12</sup> The reduction in appendicular lymphoid tissue that occurs in later life may be another reason why the disease is infrequent in elderly.<sup>13</sup>

### OBJECTIVES

(i) To find out the number and diameter of lymphoid follicles of appendix in different ages. (ii) To see whether there is any significant differences of number and diameter of lymphoid follicles in different ages.

### METHODS

**Materials:** Scalpel, forceps (pointed & toothed), L blocks

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(Leuckhart’s L piece), Haematoxylin and Eosin stain, DPX (distrene, tricresyl phosphate and xylene), microscope.

**Method:** The present study was undertaken during the year 2012 at Anatomy department of Gauhati Medical College & Hospital. Appendix of 63 males and 63 females were studied in two age groups as ‘0 to 14 years’ and ‘20 to 50 years’. Slices were made by cutting the specimen with sharp scalpel. The sizes of the slices were about 3-5mm thick. The fixation of the slices were done by keeping them in 10% formal saline (10% formal saline =100 ml formaline + 8.5 gm sodium chloride + 900 ml tap water) for 24-48 hours. The tissues were subjected to dehydration by immersing them into ascending strength of alcohol- 50%, 70%, 90% and absolute alcohol for specified time. The slices were immersed into clearing agent xylol for half an hour. Then wax impregnation was done by passing the tissue through liquid paraffin bath, maintained at about 60 degree centrigade temperature. Wax impregnation removes the clearing agent from the tissue. Paraffin blocks were prepared with the help of L blocks (Leuckhart’s L piece) washed with glycerine. Melted paraffin was poured into the squares of appropriate size and tissues were dipped into it from the impregnation bath with hot tipped forceps. The blocks were labeled with small piece of paper dipped into the block before solidification. Blocks were solidified by submerging them into cold water bath.

**Section cutting and slide preparation:** It was done by using standared procedure in the microanatomy laboratory of Anatomy department.

**Staining of the slides:** The staining was done with routine Haematoxylin and Eosin stain.

**Parameters:** Two parameters were taken for the histological study. (a) Average diameter of lymphoid follicle in micrometer. (b) Number of lymphoid follicles per low power microscopic field in average. For this purpose 20 microscopic field were counted for each specimen and average number of lymphoid follicles these were counted.

RESULTS

The results and observations of the present study is tabulated and graphed as follows:

Table 1 Diameter of Lymphoid follicles in ‘0 to 14’ years		
Number of cases	Age in years	Diameter in micrometre
1	0	0
2	5	99
3	5	105.6
4	7	132
5	8	125.4
6	8	141.9
7	10	135.3
8	11	161.7
9	13	158.4
10	14	148.5
Sum		1207.8
Mean		120.780
S.D.		±47.087
S.E.M.		±14.890

In this group, 10 number of appendix specimens were taken between the age group of 0 to 14 years where the diameter of lymphoid follicles ranges from 99 to 161.7 micrometre with a mean value of 120.780, Standard Deviation ±47.087 and Standard Error of Mean ±14.890 as evident from **Figure 1**.

Table 2 Number of Lymphoid follicles in ‘0 to 14’ years

Number of cases	Age in years	Number of follicles
1	0	0
2	5	7
3	6	9
4	7	12
5	8	15
6	8	16
7	10	16
8	11	13
9	13	16
10	14	15
Sum		119
Mean		11.900
S.D.		±5.216
S.E.M.		±1.649

In this group, 10 number of appendix specimens were taken between the age group of 0 to 14 years where the number of lymphoid follicles ranges from 0 to 16 with a mean value of 11.900, Standard Deviation ± 5.216 and Standard Error of Mean ±1.649 as evident from **Figure 2**.

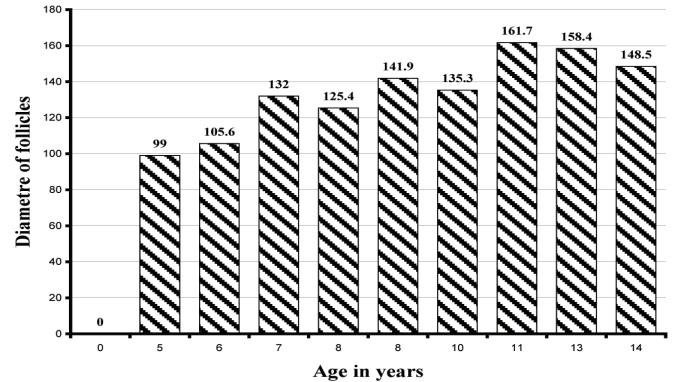


Figure 1 Diameter of lymphoid follicles in ‘0 to 14’ years

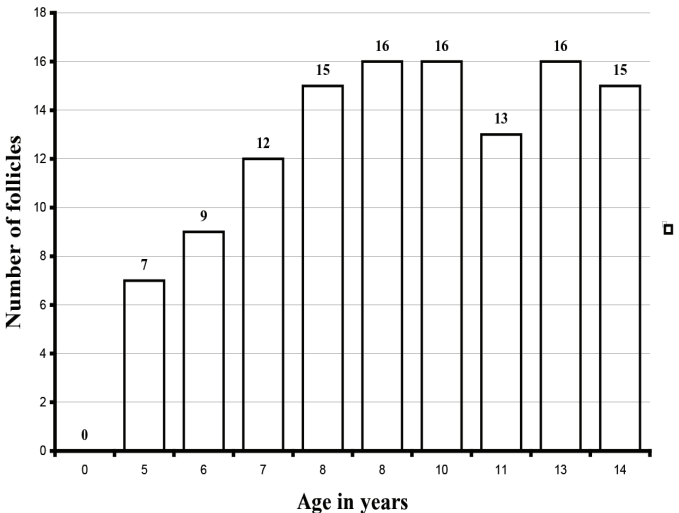


Figure 2 Number of lymphoid follicles in ‘0 to 14’ years



**Table 3** Diameter of Lymphoid follicles in '20 to 50' years

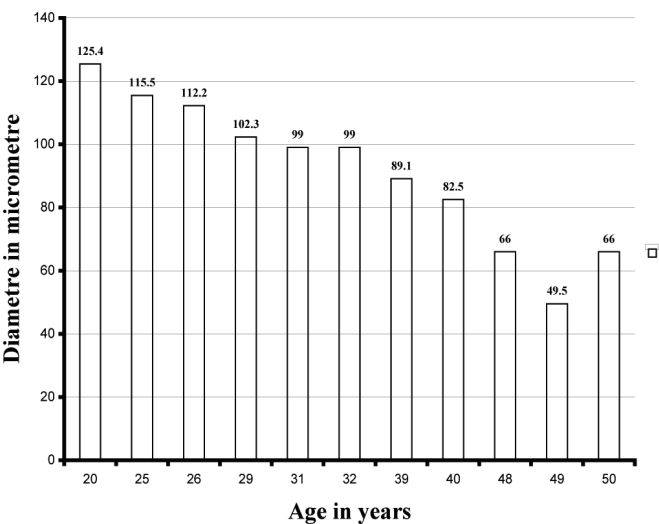
Number of cases	Age in years	Diameter in micrometer
1	20	125.4
2	25	115.5
3	26	112.2
4	29	102.3
5	31	99
6	32	99
7	39	89.1
8	40	82.5
9	48	66
10	49	49.5
11	50	66
Sum		1006.5
Mean		91.500
S.D.		±23.525
S.E.M.		±7.092

In this group, 11 number of appendix specimens were taken between the age group of 20 to 50 years where the diameter of lymphoid follicle ranges from 49.5 to 125.4 cm with a mean value of 91.500, Standard Deviation ± 23.525 and Standard Error of Mean ±7.092 as evident from **Figure 3**.

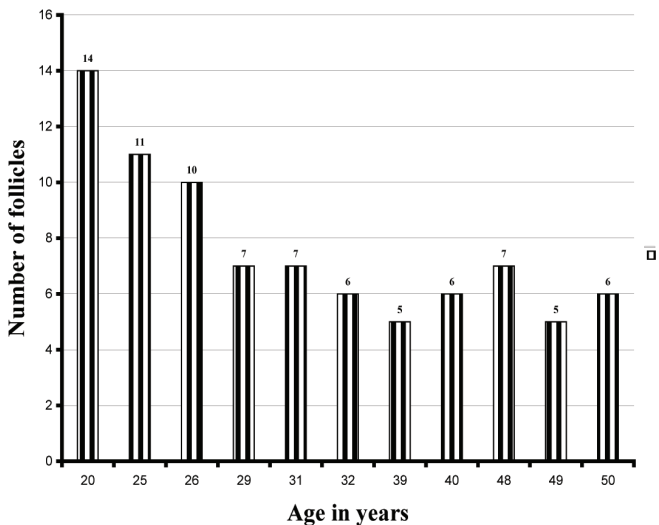
**Table 4** Number of Lymphoid follicles in '20 to 50' years

Number of cases	Age in years	Number of follicles
1	20	14
2	25	11
3	26	10
4	29	7
5	31	7
6	32	6
7	39	5
8	40	6
9	48	7
10	49	5
11	50	6
Sum		84
Mean		7.636
S.D.		±2.838
S.E.M.		±0.855

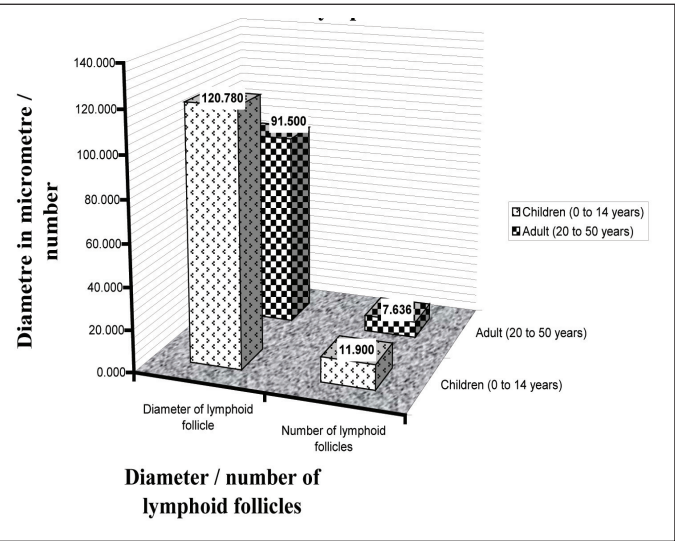
In this group, 11 number of appendix specimens were taken between the age group of 20 to 50 years where the number of lymphoid follicles ranges from 5 to 14 with a mean value of 7.636, Standard Deviation ± 2.838 and Standard Error of Mean ±0.855 as evident from **Figure 4**.



**Figure 3** Diameter of lymphoid follicles in '20 to 50' years



**Figure 4** Number of lymphoid follicles in '20 to 50' years



**Figure 5** Mean number & diameter of lymphoid follicles in both groups

**Table 5** Level of significance of differences of number and diameter of lymphoid follicle

Serial number	Comparison of mean between	t	P
1	Number of lymphoid follicle of children (0 to 14 years) & adult (20 to 50 years)	2.402	<0.05
2	Diameter of lymphoid follicle of children (0 to 14 years) & adult (20 to 50 years)	1.775	<0.05

## DISCUSSION

The appendix is an evagination of the caecum characterized by a relatively small, narrow, and irregular lumen due to presence of abundant lymphoid follicles. It contains fewer and shorter intestinal glands and has no teniae coli.<sup>14</sup>

A lot of research has been conducted till date on the microanatomy of appendix. Appendix is characterized by a great increase in the lymphoid tissue, the nodules occupying a large part of both mucous and sub mucous coat, the muscularis mucosa is rather deficient. The glands are much less closely packed than in large intestine. They are most numerous in early life and tend to disappear in old age. The lumen of appendix itself is often obliterated in later life. Researchers like Foster,<sup>15</sup> Bloom & Fawcett,<sup>16</sup> Copenhagen *et al*,<sup>17</sup> Plessis,<sup>18</sup> Borysenko and Beringer,<sup>19</sup> Cormack,<sup>20</sup> Telford and Bridgman,<sup>21</sup> have described the microanatomy of the appendix elaborately. In most of the studies the number and diameter of the lymphoid follicles of appendix are more in children than the adult.

Our study is consistent with this universal observation. Number and diameter of lymphoid follicle of appendix have been measured in matched sets of observation using the null hypothesis: Reject  $H_0$  if  $P < t_\alpha$  when  $t_\alpha = t_{0.05}$  setting the level of confidence at 95% probability signifying that if the differences in observation between the matched groups is significant at the level of  $P < 0.05$ , the hypothesis will be rejected establishing differences in length between the tested groups.

## CONCLUSION

The average number of the lymphoid follicle of appendix in the age group of '0 to 14' years is  $11.900 \pm 1.649$ . The average number of the lymphoid follicle appendix in the age group of '20 to 50' years is  $7.636 \pm 0.855$ . The average diameter of the lymphoid follicle of appendix in the age group of '0 to 14' years is  $120.780 \pm 14.890 \mu\text{m}$ . The average diameter of the lymphoid follicle of appendix in the age group of '20 to 50' years is  $91.500 \pm 7.092 \mu\text{m}$ .

We can have an inference that the number of the lymphoid follicle of appendix in the age group of '0 to 14' years is more than the age group of '20 to 50' years, which is significant ( $P < 0.05$ ) as evident in **table 5**. On the other hand the diameter of the lymphoid follicle of appendix in the age group of '0 to 14' years is more than the age group of '20 to 50' years, which is significant ( $P < 0.05$ ), as evident in **table 5**.

Finally, under limitations of the present study it may be concluded that the number and diameter of lymphoid follicles of human

appendix both increases upto adolescent period only. Afterwards, it decreases with advancement of age.

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**Conflicts of interest:** No conflict of interest is associated with this work.

**Contribution of authors:** We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

**Ethical clearance:** Taken from institutional ethical committee.

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## ORIGINAL PAPER

# Dental morphological anomalies in the adi Tribe of pasighat in Arunachal Pradesh

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## ABSTRACT

**Objective:** To identify three dental morphological anomalies of permanent teeth namely Peg Laterals, Dens Evaginatus and Rudimentary third molars in the Adi tribe of Pasighat area of Arunachal Pradesh. **Methods:** Oral examination for morphological anomalies was done in 156 individuals using a dental mirror and probe for the said anomalies and a questionnaire with details relevant to the study was used during examination. **Results:** A total of 156 samples were screened and 35% presented with at least one anomaly out of which 31% had one anomaly, 4% had two anomalies and 0% had more than two anomalies. Total number of positive cases (both single and dual) for each of the anomalies was- Peg Laterals 25%, Dens Evaginatus 20% and Rudimentary third molar 4%. One other anomaly, i.e. Cusp of Carabelli not previously considered in this study was found in 22% of the cases. **Conclusion:** The data obtained from the present study confirms the prevalence of dental anomalies namely, Peg Laterals, Dens Evaginatus, Rudimentary third molars and Cusp of Carabelli in the tribal population of Pasighat similar to other Mongoloid populations of the world.

**Keywords:** Cusp, Peg Laterals, Dens Evaginatus, Rudimentary third molars, Cusp of Carabelli

## INTRODUCTION

Dental morphological anomalies in permanent teeth are an important area of study within the subject of Dental Anatomy and Physiology. There are several reasons for studying dental anatomical variants in any population, the most significant being **enhanced diagnosis and treatment planning**. Early diagnosis of dental anomalies allow for more comprehensive treatment planning, better prognosis and in certain instances, less extensive interception.<sup>1</sup> Another important reason for studying anatomical variation is for **forensic value**. Anatomical variation related to tooth morphology may show

certain traits specific to different racial groups which may be of immense forensic value. Ancestry can be accessed by studying the facial skeleton and comparing the features with the main characteristics of three racial groups: Mongoloid, Negroid, and Caucasoid.<sup>2</sup> Also, the large variation in morphological features and their form may not be easily altered; thus a trait of the human dentition can be a valuable diagnostic tool for **anthropological studies** in classifying and characterizing different ethnic groups.<sup>3</sup> Accumulation of data on the morphological traits of teeth in different populations has let anthropologists to research further on the evolutionary significance of this data and consider its mode of inheritance. Again the incidence and degree of expression of anomalies in different population groups can provide important information for phylogenetic and genetic studies and help the understanding of variations within and between the different world populations.<sup>4</sup>

However, the occurrence of dental morphologic anomalies has not been adequately researched in the remote tribes and sub-tribes of north-east India. The present study will not only contribute towards a better understanding of the said topic but will also provide a base line data for allied branches to review.

An initial hypothesis related to the present research is as follows-Three dental anomalies of permanent teeth namely Peg Lateral, Dens Evaginatus and Microdontia of third molars

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are endemic in the Adi population of Pasighat, in Arunachal Pradesh.

**Objectives:** The aim of the study is to identify three dental morphological anomalies namely Peg laterals, Dens Evaginatus and Microdontia of maxillary third molars/Rudimentary third molars (erupted) in the tribal population in Pasighat area of Arunachal Pradesh, India.

The overall objective of the proposed study was to establish through data the occurrence of dental morphological anomalies in permanent teeth in the said population.

## METHODS

Oral examination was done using dental mirror and probe for the said anomalies and a questionnaire with details relevant to the study was used during examination. The age group selected was above 21 years. A stratified cluster sampling method for data collection was used after dividing the said Pasighat area into three main geographical groups and further stratifying them into sub groups. The three main groups are: Pasighat urban subdivision (gr 1), Balek group of villages (gr 2) and Mirmir group of villages.

A total number of 156 samples were screened in this present study distributed in the three main groups in the ratio 12:2:5 according to population ratio. Geographical area concerned with the study includes the entire Pasighat township within 10 km radius.

**Inclusion & exclusion criteria were considered as follows:**

**Inclusion criteria:** Persons belonging to the Adi tribe and age should be above 21 years.

**Exclusion criteria:** If one or both parents are not from the Adi tribe, restored teeth and unerupted third molars.

Study variables such as sub tribes of the Adi tribe (e.g: pasi, padam, panggi, minyong, milang), gender, type of anomaly and geographical distribution were considered.

## Definitions:

Peg Laterals are maxillary lateral incisors in which the mesial and distal sides converge or taper together incisally forming a peg shaped or cone shaped crown instead of exhibiting parallel or diverging proximal surfaces. Dens Evaginatus is a developmental condition that appears clinically as an accessory cusp or a globule of enamel usually on the occlusal surface between the buccal and lingual cusps of premolars unilaterally or bilaterally. Again, microdontia of third maxillary molars/rudimentary third molar are third molar teeth that are smaller in size than normal, i.e., outside the usual limits of variations.<sup>5</sup>

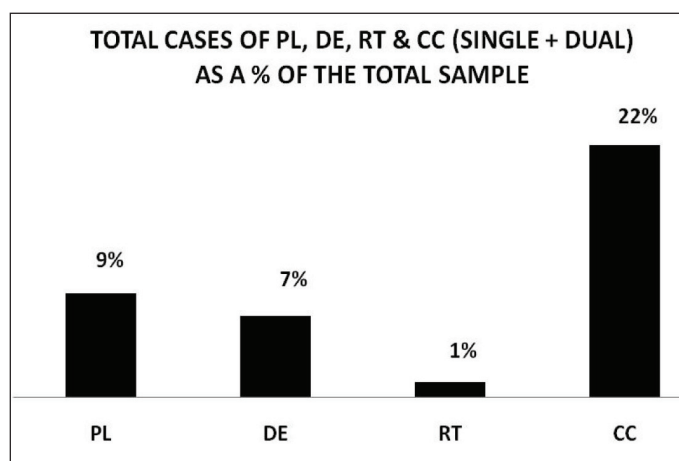
Ethical clearance was taken from the institutional ethics committee. Data analysis was done using IBM SPSS version 20 and Microsoft Excel Spreadsheet software.

## RESULTS

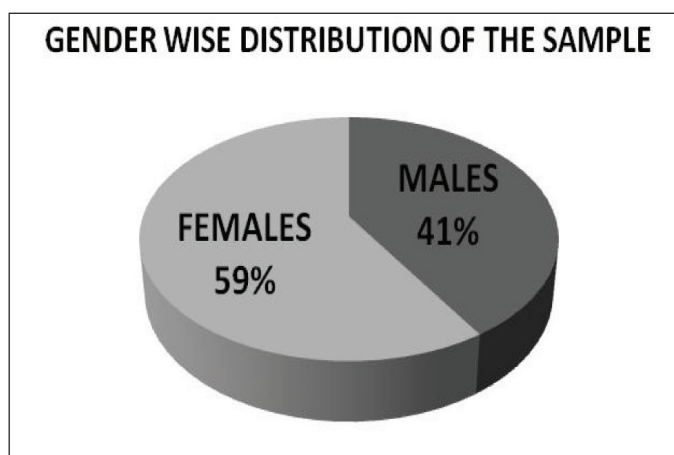
Oral examination showed the presence of three previously mentioned anomalies Peg laterals, Dens Evaginatus and Microdontia of third molars and also included positives of one other anomaly, i.e. Cusp of Carabelli in a number of the cases. Of the total sample of 156 the number of cases with anomalies was 55, i.e. 35% of the total cases screened. Of the total 156 samples number of Cusp of Carabelli found were 34, i.e., 22%, Peg laterals (PL) 14, i.e. 9%, Dens Evaginatus (DE) 11 i.e., 7%, Microdontia of third molars (RT) were 2 i.e., 1%. Of the positive 55 cases the number and percentage of individual anomalies (both single and dual) are Cusp of Carabelli 34, i.e., 62%, Peg laterals (PL) 14, i.e., 25%, Dens Evaginatus (DE) 11, i.e., 20%, Microdontia of third molars (RT) 2, i.e., 4% Again, the prevalence of anomalies was 59% in the females and 41% in the males (**Figure 2**). The distributions of anomalies in the various sub-tribes were Pasi-18%, Padam - 16%, Milang - 2%, Panggi - 4% and Minyong - 60% (**Figure 3**). Geographically, 45% of the anomalies were found in the urban area, 24% in the Balek area and 31% in the Mirmir area (**Figure 4**).

**Table 1** Number and percentage of occurrence of anomalies out of the total samples and among the positives

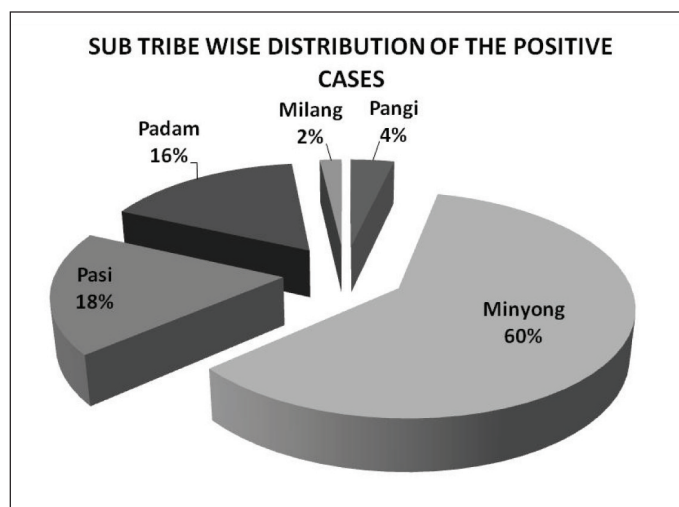
Descriptive Statistics	Observed values	% of total sample (156)	% of positive cases (55)
Total no. Of screenings (sample size)	156		
No. Of positive cases	55	35%	
No. Of cases with one anomaly	49	31%	89%
No. Of cases with two anomalies	6	4%	11%
No. Of cases with more than two anomalies	0	0%	0%
No. Of pl positive cases	14	9%	25%
No. Of de positive cases	11	7%	20%
No. Of rt positive cases	2	1%	4%
No. Of cc positive cases	34	22%	62%



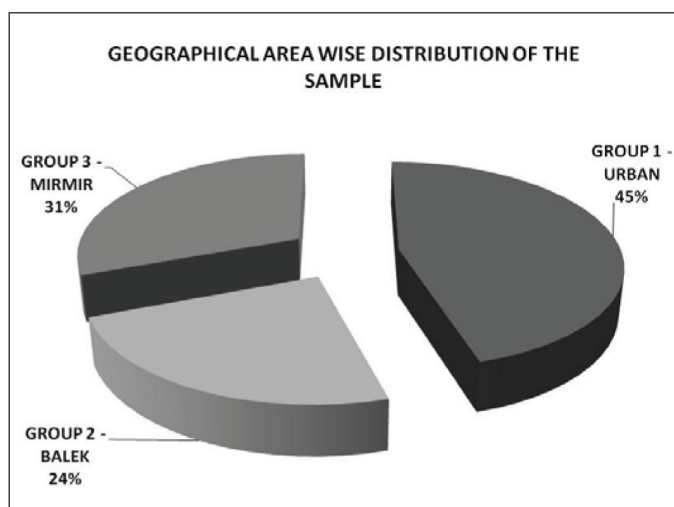
**Figure 1** Distribution of anomalies as a percentage of the total sample



**Figure 2** Gender-wise distribution of anomalies



**Figure 3** Distribution of anomalies according to the sub-tribes



**Figure 4** Geographical distributions of anomalies

## DISCUSSION

The occurrence of dental morphological anomalies has been studied by various authors in different world populations at various times. However such studies identifying dental morphological traits in the various tribes and sub-tribes of the north-eastern states of India have not received its due importance.<sup>3, 6, 7</sup>

In the present study, of the total number of 156 cases, 35% presented with at least one anomaly. 31% of the total cases had one anomaly, 4% had two anomalies and none had more than two anomalies. It was observed that 9% of the total cases were positive for Peg Lateral, 7% for Dens Evaginatus, 1% for rudimentary third molar and 22% for Cusp of Carabelli. Again to statistically analyze the results A 'Z' test of proportion was done to test the difference between the hypothesized proportion of anomalies ( $P=50\%$ ) and the observed proportion ( $p=35\%$ ) at 5% significance level. The Z test indicated that the  $p$  value  $< 0.05$ .

Chi square tests were conducted at 5 % significance level to test the difference in the distribution of anomalies according to gender, area and the various sub tribes. The tests indicated that there is

no significant difference in the distribution of anomalies with respect to gender ( $p$  value = 0.85). However, highly significant differences were indicated in the distribution of the anomalies with respect to area ( $p$  value  $< 0.001$ ) and to sub tribe ( $p$  value  $< 0.001$ ).

A study similar to our present study was done by Nayak P in Rajasthan and he found that prevalence of peg lateral was 0.4% which is very less compared to the 9% prevalence in our study.<sup>8</sup> Hua F also did a meta analysis on the prevalence of peg-shaped maxillary permanent lateral incisors and their associations with race, population type, sex, and sidedness.<sup>9</sup> The overall prevalence of peg-shaped maxillary permanent lateral incisors was 1.8%, the occurrence rates being higher in Mongoloid (3.1%) than in black (1.5%) and white (1.3%) patients. Comparatively the findings in our study showed a higher percentage of prevalence of Peg laterals. In his study women were more likely than men to have peg shaped maxillary permanent lateral incisors. The prevalence rates of unilateral and bilateral peg-shaped maxillary permanent lateral incisors were approximately the same. However, among the unilateral lateral incisors, the left side (0.4%) was twice as

common as the rightside (0.2%). Another similar study on the dental features such as size, shape, cusp number and groove pattern, etc. was done on the Tibetan immigrants of India by Sharma J.<sup>10</sup> He concluded that overall reduction in size, hypodontia of the third molar and absence of Carabelli's Cusp were a distinct evolutionary trend in Tibetan dentition. In our study however the prevalence of the Cusp of Carabelli was much higher, i.e. 22%. In another study by Stecker SS the prevalence of dental anomalies in a Southeast Asian Population in the Minneapolis area reported a higher 7.5% prevalence of peg laterals and 1.1% of Dens Evaginatus in Asians.<sup>11</sup>

In our study since no previous data relating to the prevalence of dental morphological anomalies in the Adi tribe was found, population proportion (P) with anomalies was hypothetically taken as 50%. The observed proportion following data collection and analysis was 35%. The Z test used to compare the two proportions rejected the null hypothesis. However the higher prevalence rate confirmed the presence of specific types of dental anomalies and has given us their prevalence rates for future studies.

## CONCLUSION

The data obtained from the present study confirms the prevalence of dental anomalies, namely Peg Lateral, Dens Evaginatus, Microdontia of third molars and Cusp of Carabelli in the Pasighat area of Arunachal Pradesh

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## ORIGINAL PAPER

# Pattern of homicide in gurgaon region

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### ABSTRACT

**Introduction:** Homicide means killing of human being. It is very heinous crime done by a person against other human being.

**Aim:** Aim of this study was to find out the most prominent method of homicide in Gurgaon region. **Method:** This study was a retrospective study done in the Department of Forensic Medicine & Toxicology, Faculty of Medicine & Health Sciences, SGT University, Gurgaon in association with Mortuary of Civil Hospital Gurgaon. **Results:** A total of 1196 autopsies were conducted at Mortuary, Civil hospital Gurgaon during the period from January 2016 to December 2016, out of which, 60(5%) cases were of alleged homicidal death. Majority of victims were in the age group of 31-40 years with Male:Female ratio; 4.1 were observed. 78.3% victims were male. 51.67% of total victims were resident of place outside Gurgaon with majority of male victims. Contusion was found in maximum cases followed by fracture 78.3% death were due to mechanical injuries followed by asphyxial death which is in 21.7%. Head injury was observed as a major cause of death in 36.7% cases. **Conclusion:** The most affecting age group was 31-40 years with male predominance. 78.33% cases were died due to mechanical injuries, out of which maximum due to blunt weapon.

**Keywords:** Sharp weapon, blunt weapon, firearm

### INTRODUCTION

Life and death are two undeniable facts in this world. Like birth, death is also inevitable. There is only one way for birth, there are many ways to die. Homicide is legally defined as destruction of human life by the act, agencies, procurement or culpable omission of some other person or persons.<sup>1</sup> Homicide is prevalent all over the world.<sup>1</sup> Globally around 5,20,000 people die every year due to interpersonal violence, which equates nearly 1400 deaths every day.

The various methods of homicidal deaths are injury by blunt weapon, sharp weapon, firearm, strangulation, homicidal hanging (Lynching), smothering, poisoning etc. The pattern and incidences of homicides are increasing because of

population explosion, changes in life style, modern needs of men and easy availability of various types of weapons. In view of the magnitude and frequency of such deaths and its impact on the society, the present study is under taken so as to find out the most vulnerable age group, sex incidence, pattern of homicide, residence of victim of crime, region of the body involved and cause of death.

In India, after many years of independence, the rate of homicides is increasing day by day. As per National Crime Record Bureau, violent crimes reported in India were 10.9% of the total Indian Penal Code crimes. The total number of murders recorded all over the India in 2010 was 33,335. There are consistent differences in rates of homicide victimization between males and females and young and old. In terms of age difference, homicide victimization rates are generally higher for young adults, especially young adult males.

### METHODS

A retrospective study regarding the various patterns of homicide in Gurgaon region was done in the Department of Forensic Medicine & Toxicology, Faculty of Medicine & Health Sciences, SGT University, Gurgaon in association with Mortuary of Civil Hospital Gurgaon during the period from January 2016 to December 2016. All the cases were included in this study who were brought to the mortuary of Civil Hospital Gurgaon for the medico-legal post-mortem examination with alleged history of homicide. Cases of

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unnatural deaths where the cause of death could not be ascertained due to insufficient/improper history, gross decomposition and inadequate findings were excluded from the study. Autopsies were conducted as per the standards by the routine autopsy instruments.

## RESULTS

During the period from January 2016 to December 2016, total 1196 Autopsies were conducted, of which 60 cases were of homicide (5.0%).

**Table 1** According to age and sex of deceased

Age Group (yrs)	Male (%)	Female (%)	Unknown (%)	Total No. (%)
<1	00 (0)	00 (0)	00 (0)	00 (0)
01-10	02 (3.3)	02 (3.3)	00 (0)	04 (6.6)
11-20	05 (8.3)	02 (3.3)	00 (0)	07 (11.6)
21-30	16 (26.7)	02 (3.3)	01 (1.7)	19 (31.7)
31-40	15 (25.0)	05 (8.3)	00 (0)	20 (33.3)
41-50	08 (13.3)	00 (0)	00 (0)	08 (13.3)
51-60	01 (1.7)	00 (0)	00 (0)	01 (1.7)
Above 60	00 (0)	01 (1.7)	00 (0)	01 (1.7)
Total	47 (78.3)	12 (20.0)	01 (1.7)	60 (100)

In **Table 1**, the distribution of cases among males is 78.3%, i.e., 47 cases and that of females is 20.0%, i.e., 12 cases. The maximum % age of homicidal cases in this study among males is 26.7% in the age group of 21–30 years followed by 25.0% in the age group of 31–40 years. While in Females, the maximum % age is in the age group of 31–40 years with 8.3% followed by 3.3% in the age group of 01–10, 11–20 and 21–30 years. The only case found in Unknown category in the age group 21–30 years which contributes 1.7%. No case received below the age of 1 year in all categories in **Table 1**.

**Table 4** Region of Body involved

	Head & Neck			Thorax & Abdomen			Limbs (Upper & Lower)		
	Male	Female	Others	Male	Female	Others	Male	Female	Others
Abrasion	04	00	00	07	01	00	04	02	00
Contusion	37	19	01	28	15	00	21	09	00
Laceration	26	06	00	01	01	00	00	00	00
Incised Wound	07	14	00	00	03	00	04	20	12
Stab Wound	00	01	00	04	08	10	00	04	00
Fracture	15	02	00	04	01	00	06	02	00
Firearm Laceration	13	01	00	19	02	00	11	02	00
TOTAL	102	43	01	63	31	10	46	39	12
	146			104			97		

Head & Neck region was involved with a total number of 146 injuries among all the cases while Thorax and Abdomen region was involved with a total of 104 injuries in number. A total of 97 injuries were reported in extremities as shown in **Table 4**.

Maximum no. of cases was reported with injury by blunt weapon,

**Table 2** Community characters of victim

Area	Males (%)	Females (%)	Others (%)	Total no. (%)
Gurgaon	18 (30.0)	04 (6.7)	00 (0)	22
Outside Gurgaon	26 (43.3)	04 (6.7)	01 (1.7)	31
Unknown	3 (5.0)	04 (6.7)	00	07
TOTAL	47 (78.3)	12 (20.0)	01 (1.7)	60 (100)

**Table 2** shows the distribution of cases as per the residence of victim. Among 47 cases (78.3 %) of males, 26 cases (43.3 %) were residents of other district than Gurgaon followed by 18 cases (30.0%) were resident of district Gurgaon, while there is equal distribution in all categories of Table no. 2 with 4 cases which contribute 6.7% in females.

**Table 3** Type of Injuries

Type of Injury	Male	Female	Others
Abrasion	06	02	00
Contusion	21	10	01
Laceration	17	03	00
Incised Wound	02	03	01
Stab Wound	03	02	01
Fracture	24	07	00
Firearm Laceration	14	03	00
Nil (others)	00	00	00
TOTAL	87	30	03

In 53.3% cases were noted with contusion followed by 51.7% cases with fracture while lacerations were noted in 33.3% cases. 28.3% cases were noted with Firearm laceration, while 13.3% cases were noted with abrasion, incised and stab wounds were noted in 10.0% respectively as shown in **Table 3**.

i.e., 22 cases (36.6%) followed by 18 cases (30.0%) with firearms. Sharp weapons were involved in 7 cases with a % age of 11.7. Asphyxial cases were 13 with a distribution of 8 cases (13.3%) of ligature strangulation, 3 cases (5.0%) of manual strangulation and 2 cases (3.3%) of smothering as shown in **Table 5**.

**Table 5** Type of weapon used

Type of Weapon	Male (%)	Female (%)	Others (%)	Total No. (%)
Firearms	15 (25.0)	03 (5.0)	00 (0)	18 (30.0)
Blunt Weapon	20 (33.3)	02 (3.3)	00 (0)	22 (36.6)
Sharp Weapon	04 (6.7)	02 (3.3)	01 (1.7)	07 (11.7)
Ligature Strangulation	06 (10.0)	02 (3.3)	00 (0)	08 (13.3)
Manual Strangulation	00 (0)	03 (5.0)	00 (0)	03 (5.0)
Smothering	02 (3.3)	00 (0)	00 (0)	02 (3.3)
TOTAL	47 (78.3)	12 (20.0)	01 (1.7)	60 (100)

Head Injury was reported as cause of death in 22 cases with a % age of 36.7, while Shock & Haemorrhage was reported in 21 cases with a % age of 35, Asphyxia was reported as cause of death in 13 cases (21.6%) while 4 cases (6.6%) were reported with shock & septicaemia as shown in **Table 6**.

**Table 6** Cases according to the cause of death

Cause of death	Male (%)	Female (%)	Unknown (%)	Total no. (%)
Head Injury	21 (35.0)	01 (1.7)	00 (0)	22 (36.7)
Shock & Haemorrhage	14 (23.3)	06 (10)	01 (1.7)	21 (35.0)
Asphyxia	08 (13.3)	05 (8.3)	00 (0)	13 (21.6)
Shock & Septicaemia	04 (6.6)	0 (0)	00 (0)	04 (6.6)
Total	47 (78.3)	12 (20.0)	01 (1.7)	60 (100)

## DISCUSSION

Homicide (homos: human being, caedere: to kill) means to kill a human being. Violence is a significant problem of the society and homicide is the severest form of violence, depriving a human being of his fundamental right to live. The pattern of homicide is affected by various factors such as economic condition, political condition, type of population, availability of weapons, behavioural problems, etc.

In this present study, total 1196 autopsies were conducted, of which 60 cases (5.0%) were of alleged homicide. In this study, the incidence of homicide is on the lower side than the incidence of homicide observed by Rekhi et al<sup>2</sup> (53.6%), Murty et al<sup>3</sup> (15.1%), Sinha et al<sup>4</sup> (5.9%), Basappa SHugar et al<sup>5</sup> (4.32%), Shah Jainik P et al<sup>6</sup> (2.70%). However, Gupta et al<sup>7</sup> noted the incidence of 5.0% of homicides out of the total medico-legal deaths which is equal to the incidence observed in this study.

In this study, the preponderance of victims (33.3%) was in the age group of 31- 40 years. It is towards the age group of 21-30 years in 40% of victims in study by B.C. Shivakumara et al<sup>8</sup>, in age group 20-29 years in 49.2% cases by Basappa S Hugar et al<sup>5</sup> while Shah Jainik P et al<sup>6</sup> and Sachidananda Mohanty et al<sup>9</sup> observed maximum cases in the age group of 21- 30 years in 38% cases and 35% cases respectively.

Blunt weapon usage was observed in 36.6% cases followed by firearms in 30% cases while 50% of weapon was sharp followed by blunt weapon (30%) as observed by BC Shiva kumara et al.<sup>8</sup> Basappa S Hugar et al<sup>5</sup> observed sharp weapon as the most common in 33.25% followed by blunt weapon in 28% cases, Shah Jainik P et al<sup>6</sup> observed injuries sustained by sharp force were

found in 40.26% cases followed by 33.77% cases having blunt force injuries. Sharp weapon was used in 36.61% cases followed by blunt weapon in 24.41% in the study conducted by Sachidananda Mohanty et al<sup>9</sup> Firearm was used as method of homicide in maximum cases (42.4%) followed by blunt weapon (13.6%) in study conducted by Upadhyay P & Tripathi CB.<sup>10</sup>

In this study, head injury was observed as a cause of death in maximum cases (36.7%) followed by shock and haemorrhage (35%). The cause of death was found head injury in 43% cases followed by violent asphyxia (14%) in study by Shah Jainik P et al<sup>6</sup> while Sachidananda Mohanty et al<sup>9</sup> observed haemorrhage and shock being the most common cause of death in 44.07% cases followed by cranio-cerebral injuries (34.58%).

## CONCLUSION

- ◆ Incidence rate of homicidal death was 5.0% and affecting age group was 31- 40 years with male predominance.
- ◆ Majority of the victims of homicide were permanent resident of place other than Gurgaon region.
- ◆ 78.33% cases were died due to mechanical injuries, out of which maximum due to blunt weapon.
- ◆ Injuries over head were observed in majority of cases.
- ◆ Fracture of bones was noted in majority of the cases.

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**Ethical clearance:** Taken.

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## ORIGINAL PAPER

# Knowledge regarding assisted reproductive technology among infertile couples

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### ABSTRACT

**Introduction:** Infertility is defined as a failure to conceive within one or more years of regular unprotected coitus. Most of the infertile couples are not having adequate knowledge regarding recent advancements in infertility management which is leading to the reduced acceptance of this treatment. **Aims:** The study is attempted to evaluate the effectiveness of structured teaching programme on knowledge regarding Assisted Reproductive Technology among the infertile couples in selected hospitals of Guwahati, Assam. **Methods:** Sixty infertile participants from the selected hospitals of Guwahati, Assam were selected. A structured questionnaire was developed to assess the pre-test and post-test knowledge of infertile couples. Structured teaching programme was conducted after administering the pre-test. And post test was administered after one week. **Results:** The findings of the study revealed that out of 60 infertile participants 50% belonged to age group 35 and above years and 60% of the infertile participants had an education level of graduate and above. The mean post test score (28.85) was higher than the mean pre test score (18.96). The 't' value was found highly significant ( $t_{59} = 16.74$ ). So it is evident that post test knowledge scores were higher than the pre test knowledge scores. There was significant association between the knowledge of the infertile participants with educational level.

**Conclusion:** This study shows that structured teaching programme is very effective in improving the knowledge of infertile couples regarding assisted reproductive technology, but there is a need for conducting such programme frequently.

**Keywords:** Infertility, Infertile Participants, Structured teaching programme, Assisted Reproductive Technology

### INTRODUCTION

A child is a dream of every couple as it brings meaning to their life and immense pleasure of having blessed phase parenthood.<sup>1</sup> Parenthood is a rudimentary human need. Every human being has a desire to become a parent and look after his or her children.<sup>2</sup> The stress of the non-fulfilment of a wish for a offspring has

been associated with emotional squeal such as anger, depression, anxiety, marital problems and feelings of worthlessness. Partners may become more anxious to conceive, ironically increasing sexual dysfunction and social isolation and many other psychological problems.<sup>3</sup> Infertility is commonly defined as a failure to conceive within one or more years of regular unprotected coitus.<sup>4</sup> The 12-month timeframe is arbitrary and some couples are able to conceive on their own beyond the one-year threshold.<sup>5</sup> In Latin America, strong social stigma attached to infertility and machismo cause women to blame themselves for infertility<sup>6</sup> while in Mozambique, infertile women are excluded from certain social activities and traditional ceremonies.<sup>7</sup> Majority of the infertile couple are unaware of the reasons for infertility and the remedies available to overcome the problem.<sup>8</sup> Knowledge of infertile couples about **assisted reproductive technology (ART)** is a fundamental parameter to optimize the infertility treatment and conduct it co-operatively.<sup>9</sup> A descriptive study was conducted by Sowjanya G to assess the knowledge and attitude of 50 infertile women regarding ART at Gunasheela IVF centre, Bangalore. Out of 50 subjects' assessment of knowledge regarding ART revealed that majority 64% of them had moderately adequate knowledge, 20% had inadequate knowledge and remaining 16% had adequate knowledge regarding ART.<sup>10</sup> Daniluk JC et al conducted a study to determine the knowledge about fertility and Assisted Human Reproduction (AHR) treatments on 3345 childless women. On analysis the majority of participants rated themselves as having some knowledge or being fairly knowledgeable about fertility and AHR.<sup>11</sup> Different techniques of ART play important roles in

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infertility treatment. The more they know about treatments and their process, the self-consciousness and mental relaxation of patients will be better. Hence, as a first step towards this, investigator have planned to conduct a study to assess the effectiveness of structured teaching programme on knowledge regarding ART among the infertile couples of selected hospitals of Guwahati, Assam.

**Objectives:** (i) To evaluate the effectiveness of structured teaching programme on knowledge regarding Assisted Reproductive Technology among infertile couples in selected hospitals of Guwahati. (ii) To determine the association between the pre-test knowledge of infertile couples in relation to selected socio-demographic variables viz. age, sex, education, occupation and clinical variables viz. duration of treatment, source of information.

## METHODS

The study was an experimental study. This study was conducted at Pratiksha hospital, Guwahati, Assam. Sample size of the present study was 60 infertile participants after informed consent. Convenient sampling technique was employed to select sample. Self administered structured questionnaire was used for the study which includes three sections as follows—

**Section I** - Consists of socio-demographic and clinical variables of the participants such as age, sex, education, occupation, duration of treatment, source of information. **Section II** - It includes 10 multiple choice questions which assessed the level of knowledge regarding fertilization. **Section III** - It includes 30 multiple choice questions which assessed the level of knowledge regarding infertility and Assisted Reproductive Technology. The reliability was found as  $r = 0.94$  which was considered to be reliable and adequate. The data was analyzed using SPSS software. The data was collected from 9<sup>th</sup> January, 2017 to 4<sup>th</sup> February, 2017.

## RESULTS

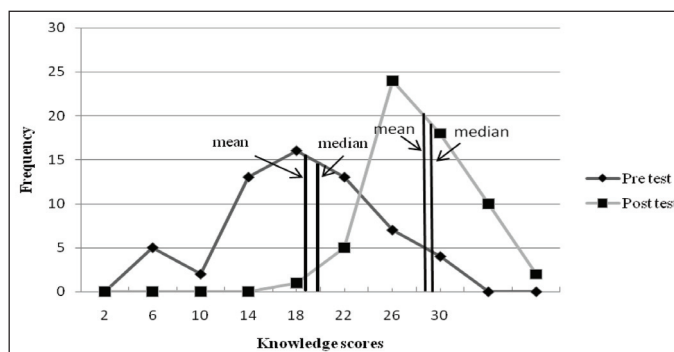
The results and observations of the present study is tabulated and graphed as follows:

**Table 1** Pre-test & Post-test level score of knowledge

	Mean	Mean difference	't' value	Median	SD	Standard error
Pre test	18.96	9.89	16.74	20	5.95	0.77
Post test	28.85			29	3.91	0.51

The mean post test score 28.85 was higher than the mean pre test score 18.96. The median post test knowledge score 29 also showed higher than the median pre test knowledge score 20 and the post test score SD=3.91 seemed to be less dispersed than the pre test score SD=5.95. So it is evident that post test knowledge scores were higher than the pre test knowledge scores. The  $df$  (59) ' $t$ '=2. Since tabulated ' $t$ ' value is less than calculated ' $t$ ' value, we reject the null hypothesis and accept the research hypothesis. (Table 1)

The pre-test and post-test knowledge score of infertile participants regarding Assisted Reproductive Technology was depicted in fig 1 in the form of frequency polygon. In both the



**Figure 1** Pre-test and post-test knowledge scores

pre test and post test frequency polygon mean and median lies close to each other and mean lies to the left of the median which indicates that the scores were negatively skewed. The skewness of pre-test and post-test frequency polygon were (-0.52) and (-0.12). So it was evident that post test knowledge scores of the subjects fall beyond the pre test knowledge scores which indicate that there was a considerable gain in knowledge scores after administration of structured teaching programme. (Figure 1)

## Association between pre-test levels of knowledge with selected socio-demographic variables

There is significant association of pre-test knowledge of participants regarding ART with education. Thus the research hypothesis “There is significant association between the existing knowledge scores with selected socio-demographic variables of infertile couples” is accepted.

**Table 2** Pre-test level of knowledge vs. socio-demographic variables

Age	Chi square ( $\chi^2$ ) Value	Df	Tabulated value	Significance
20— 24 years	4.46	6	12.59	NS
25— 29 years				
30— 34 years				
35 years and above				
<b>Gender</b>				
Male	5.45	2	5.99	NS
Female				
<b>Education</b>				
Primary school	13.65	6	12.59	S*
High school				
Higher secondary				
Graduate and above				
<b>Occupation</b>				
Unemployed	12.74	8	15.51	NS
Government service holders				
Private service holders				
Health personnel				
Business				

S\* = Significant at 0.05 level of significance,

NS = Not significant

On the other hand there is no significant association of pre-test knowledge of participants regarding ART with age, gender, occupation (**Table 2**).

**Table 3** Pre-test level of knowledge vs. clinical variables

Duration of Treatment	Chi square ( $\chi^2$ ) Value	Df	Tabulated value	Significance
Below six month	4.21	4	9.49	NS
Six month to one year				
Above one year				
Source of information				
Health Personnel	8.93	6	12.59	NS
Family				
Friends				
Mass media(TV, Newspaper, Internet, books)				

S\* = Significant at 0.05 level of significance, NS = Not significant

## DISCUSSION

In the present study, the mean post test score (28.85) was higher than the mean pre test score (18.96). Present study findings are consistent with the study conducted by Devi AM on the effectiveness of planned teaching programme on ART among 55 GNM III year students of selected nursing school at Mangalore. The mean difference between pre-test (15.25) and post-test (30.50) knowledge score of students on assisted reproductive technology was found to be statistically significant.<sup>12</sup> Again, the study findings also supports the study conducted by Lalithapriya M on knowledge of nursing students regarding ART and effectiveness of planned teaching programme in improving the knowledge in the selected college in Tamil Nadu. The mean percentage knowledge score in pre-test was 39.8 and post-test was 74.5 which is consistent with the present study.<sup>13</sup> Another study conducted by Bennett LR et al to investigated the reproductive knowledge among female Indonesian infertility patients found that knowledge about the causes and treatment of infertility was very poor within the samples which is consistent with the present study.<sup>14</sup> In the present study, while assessing the association between the pre-test knowledge and the selected socio demographic variables result of chi square shows that there were significant association between the pre-test knowledge with Education. On the other hand, chi square value between the pre-test knowledge and the selected demographic variables like age, gender, occupation were not significant at 0.05 levels. Above findings are consistent with the study conducted by Pourmasumi S et al about knowledge of infertile couples regarding ART. This study shows that more educated people had more knowledge. There was no significant relation between duration of infertility, age and gender.<sup>15</sup> This finding was supported by the study done by Sowjanya G to assess the knowledge and attitude of infertile women regarding assisted reproductive techniques. The study reveals that there was a statistically significant association found between level of knowledge and education.<sup>10</sup>

## CONCLUSION

Though infertility does not claim an individual life, it inflicts

devastating emotional trauma on the individual for being unable to fulfil the biological role of parenthood for no fault of his/her own. Though planned teaching programme is very effective in improving the knowledge of infertile couples regarding ART, but there is a need for conducting such programme frequently.

**Conflict of interest:** Nil.

**Ethical clearance:** Taken from Institutional Ethics Committee.

**Contribution of authors:** Declared that this work was done by the authors named in this article.

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## ORIGINAL PAPER

# Spectrum of ovarian cystic lesions- a histopathological study

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### ABSTRACT

**Objective:** The aim of this retrospective study is to determine the frequency of ovarian cystic lesions involving both neoplastic and non-neoplastic entities, its distribution and histopathological spectrum including both benign and malignant lesions. **Method:** This study involved analyzing 67 cases of cystic ovarian lesions /tumors reported in Histopathology section of Tezpur Medical College and hospital in a 24 month period. They were classified according to WHO classification of ovarian tumors (2003). Clinical details of patients were perused according to archived records. **Result:** Cystic lesions were grouped according to their nature whether neoplastic or non-neoplastic and whether benign, borderline or malignant. The neoplastic cystic lesions comprise the majority of lesions comprising 64.17% while non-neoplastic lesions comprise 35.82%. Among neoplastic lesions cyst adenomas comprise majority (46.5%) of benign lesions and malignant lesions comprise 6.9% of lesions. Among non-neoplastic lesions simple/follicular cysts comprise 54.16% of lesions. **Conclusion:** Benign cystic neoplastic lesions outnumber the non-neoplastic lesions and benign tumors are more common than malignant ones. Ovarian lesions are not easily detected by physical or laboratory investigations hence one has to depend in addition to microscopic appearance of the tumor other clinical parameters such as age of the patient, presenting complaints, location of lump and dimension of lump.

**Keywords:** Serous cyst adenoma, papillary serous cyst adenocarcinoma, undifferentiated carcinoma

### INTRODUCTION

The ovaries are responsible for a variety of cystic lesions which are attributed to multiple hormonal and physiologic stimuli right from childhood to menopause. An adnexal mass is one of the most common management dilemmas. Even non neoplastic cystic lesions are also frequently responsible for a pelvic mass and associated with abnormal hormonal manifestations often mimicking a neoplasm thus causing diagnostic confusion. Also important to note that some feminising ovarian lesions are also

responsible for some endometrial carcinomas. Ovarian neoplastic lesions are notorious for their large size and relatively mild symptoms.<sup>1</sup> In spite of recent advances Pelvic ultrasound, MRI and CT imaging has compounded the problem by detecting incidental cysts in asymptomatic women without the ability to differentiate reliably between the non-neoplastic lesions and benign from malignant ones.<sup>2</sup> The rate of ovarian tumors is 2-6 cases per 1,00,000 women per year in Asian countries<sup>3</sup> and in India it is comprising of up to 8.7% cancers in the different parts of the country.<sup>4</sup> In addition the ovary is also a very common metastatic site frequently presenting with unknown primary requiring in certain cases a proper immunohistochemistry study. Diagnosis of various histological patterns and incidence in different age groups of ovarian neoplasms and non-neoplastic cysts are therefore very important in diagnosis, treatment and prognosis.

### METHODS

This retrospective study was done in the department of pathology, TMCH and cases from March, 2014 to February, 2016 were included. All cases of symptomatic ovarian cystic lesions that went oophorectomy or hysterectomy with bilateral salpingectomy were included in the study. Oophorectomy specimens without pathologic changes were excluded. The data was obtained which consists of relevant information about age, clinical presentation, size of tumor, bilaterality, provisional diagnosis and operative findings. Gross and microscopic findings of cases were studied. Representative tissue sections were taken as per surgical pathology protocol.<sup>5</sup> Slides were then stained with Haematoxylin and Eosin (H&E) and reported as per WHO classification 2013.

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RESULTS

Among the total 67 cystic lesions studied in this paper, 43 were neoplastic (62.69%) and 24 were non neoplastic (37.31%).

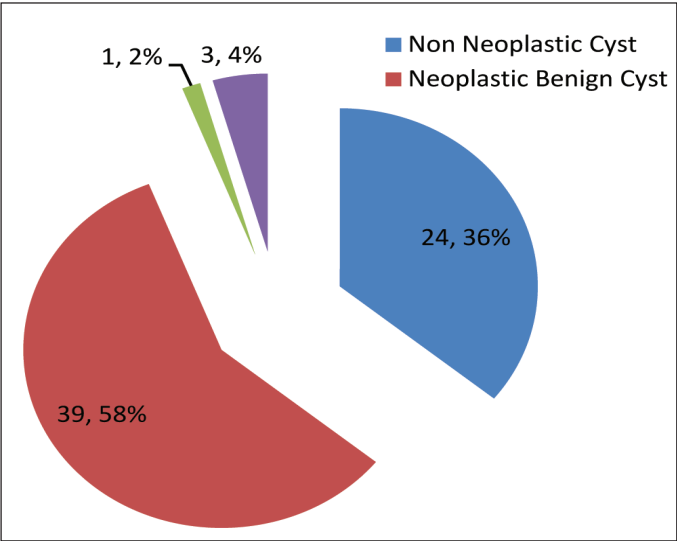


Figure 1 Pie chart showing % distribution of all cases of cysts

The patient age range for all cases was from 14 years to 71 years. 55 cases were unilateral and 12 cases had bilateral masses. The patients usually presented with lower abdominal pain/fullness/ menstrual irregularities with bleeding between periods/mass abdomen on ultrasound. One case of a 14 year old child with a ruptured corpus luteal cyst presented clinically with acute intra-abdominal hemorrhage. Non neoplastic cysts ranged in size from 3 cm to 7 cm with simple/follicular cyst accounting for 54.16% of cases.

Table 1 Incidence of Non-neoplastic cysts

Types of cystic lesions	No of cases(24)	Percentage distribution
Simple/follicular cyst	13	54.16%
Endometriotic cyst	04	16.66%
Corpus luteal cyst	04	16.66%
Surface inclusion cyst	03	12.5%

The neoplastic cysts comprised majority of all cystic lesions, comprising of 43 cases (62.69%). The age range of benign neoplastic lesions was from 20 years to 70 years with serous cyst adenomas comprising majority of lesions. The size ranged it was from 3 cm to 12 cm. Incidence of benign tumors is shown below.

Table 2 Incidence of Neoplastic (Benign) cyst

Types of cystic lesions	No of cases(39)	Percentage distribution
Mature cystic teratoma	19	48.71%
Serous cystadenoma	14	35.89%
Mucinous cystadenoma	06	15.38%

Malignant cystic lesions were 3 in no comprising 6.9% of all neoplastic lesions. Age ranged from 40 years to 60 years. One case each of papillary serous cyst adenocarcinoma, granulosa cell tumor ovary and undifferentiated carcinoma ovary were seen. All were unilateral and size ranged from 10 to 18 cm. One case of granulosa cell tumor ovary seen also had associated complex endometrial hyperplasia with atypia. Also one case of unilateralborderline mucinous cyst adenoma was seen.

Table 3 Incidence of malignant cyst

Types of cystic lesion	No of cases(3)	Percentage distribution
Papillary serous cysta denocarcinoma	01	33.33%
Granulose cell tumor	01	33.33%
Undifferentiated carcinoma	01	33.33%

DISCUSSION

The ovary is a complex structure from an embryological, anatomical and functional point of view. Before ultrasound was routinely available the finding of a pelvic mass or a palpable ovary<sup>6</sup> particularly in post-menopausal women was considered to be an indication for surgery, but with advanced in diagnostic procedures percutaneous USG guided FNAC now appears a useful tool in identifying the non-neoplasticcysts.<sup>7</sup> Realizing that the ovary is partially a cystic structure and the risk of malignancy is small suggests that many of these cases may be handled conservatively.<sup>8</sup>

In this study there were 67 total cases of ovarian cysts out of which 24 were non-neoplastic (37.31%), 39 were benign (58.20%), 1 were borderline (1.49%) and 3 were malignant (4.47%). These results are similar incomparison to the findings of Gurung et al<sup>9</sup> who had in their two year study of 135 cases had 43.7% non-neoplastic lesions and 56.3% neoplastic lesions. Also a 3 year study done in the same centre by Pudasani et al<sup>10</sup> out of 102 cases had 87.3% benign cysts and tumors and 12.7% malignant tumors. Similar were findings of Kreuzer et al<sup>11</sup> and Martinez et al.<sup>12</sup> However Zaman et al<sup>13</sup> encountered 68.87% non-neoplastic lesions and 31.12% neoplastic lesions. This disparity could be attributed partly to inclusion criteria as in our case only cysts causing clinical symptoms were included. Also important to note thatin our study the low no of cases can be attributed to our college being only a very new medical college set up only 3 years ago.

Among the 24 non-neoplastic cyststhe majority were simple/ follicular cysts 13 in no (54.16%), endometriotic cyst 4 in no (16.66%), corpus luteal cyst 4 in number (16.66%) and surface inclusion cyst 3 in number (12.5%). These findings are in concordance with Gurung et al<sup>9</sup> who out of 59 cases (43%) had 17% cases of endometriotic cyst and 9.6% cases of corpus luteal cyst. Kanthikar et al<sup>14</sup> also found follicular cysts in 76.7% and corpus luteal cyst in 20.54% cases. Incidence of endometriotic cyst was similar to Fatima Z<sup>15</sup> and Tanwani et al<sup>16</sup> who found 16% and 20% cases respectively. Age range in Endometriotic cyst

cases in our study was from 20-32 years with a mean of 25 years which was similar to Saeed et al<sup>17</sup> who found a mean of 25-29 years.

This study had 39 benign tumors (58.20%) out of which 20 were benign surface epithelial tumors (51.28%) and 19 were germ cell tumors (48.71%). The benign epithelial tumors were serous cystadenoma (35.89%) and mucinous cystadenoma (15.38%). Our findings were similar to Pudaisini et al<sup>10</sup> who had serous cystadenoma (40.2%) and mucinous cystadenoma (9.8%) cases. All the Benign germ cell tumors in the study was a mature cystic teratoma (48.71%) which ranged from 21 years to 58 years which was also similar to Gurung et al<sup>9</sup> who had an age range from 13 to 60 years.

**Table 4** Comparison table of frequency of germ cell tumors

Ovarian tumors	Couto et al <sup>18</sup>	Pilli et al <sup>19</sup>	Gupta et al <sup>20</sup>	Bhuvanesh et al <sup>21</sup>	Kanthikar et al <sup>14</sup>	Gurung et al <sup>9</sup>	Present study
Germ cell tumors	20.39%	21.2%	23.9%	10.85%	22.85%	58%	48.71%

Incidence of mature cystic teratoma in our study and Gurung et al is quite similar and high in contrast to other studies in different parts of the country. Geographic diversity, different study periods may explain the differences. However further evaluation is needed.

**Table 5** Comparison table of frequency of surface epithelial tumors

Ovarian tumors	Bhattacharya et al <sup>22</sup>	Gupta et al <sup>20</sup>	Couto et al <sup>18</sup>	Jha et al <sup>23</sup>	Pilli et al <sup>19</sup>	Bhuvanesh et al <sup>21</sup>	Present study
Surface epithelial tumors	61.60%	48.8%	68.81%	52.2%	70.9%	78.57%	51.28%

From above chart the incidence of surface epithelial lesions in our study was similar to many of the studied already done<sup>20, 23</sup> and this may be because of differences in reporting criteria as we have considered an anechoic cystic unilocular mass <3 cm to be within normal limits.<sup>9</sup>

Our study had 3 cases of malignancy (6.9%) of which two were aged 40 years and remaining one aged 60 years with a mean of 46.6% years. One case each of surface epithelial tumor (33.33%), sex cord stromal tumor (33.33%) and undifferentiated carcinoma (33.33%) was seen. Abdulla et al<sup>24</sup> also found 33.33% cases of serous carcinoma along with similar findings by Gupta et al and Khan et al.<sup>25</sup> Peak incidence of invasive epithelial ovarian cancer is at 50-60 years of age according to Kanthikar et al<sup>14</sup> and Abdulla et al<sup>24</sup> found a prevalence of malignancy at only 15.6% between 20-51 years and 49.3% between 51 and above.

Merino et al<sup>26</sup> and Abdulla et al<sup>24</sup> found young females aged 30-40 years of age are frequently affected by borderline tumors. Our patient with a borderline mucinous cyst adenoma was however 52 years old.

Our case of granulosa cell tumor was premenopausal and had associated complex endometrial hyperplasia with atypia. Ukah et al<sup>27</sup> also found excess estrogen secreted by these tumors causes continuous stimulation of endometrial lining which can cause

endometrial hyperplasia and potentially endometrial cancer.

The lack of diversity of lesions in this study necessitates further studies concentrating in this part of North East India with more case load to accurately reflect the distribution of different types of ovarian neoplasms.

## CONCLUSION

Benign cystic neoplastic lesions outnumber the non-neoplastic lesions and benign tumors are more common than malignant ones. However in spite of being uncommon malignant lesions is a silent menace and is not associated with significant symptoms. The study has reaffirmed the occurrence of primary malignant ovarian tumors in younger age groups. Also depending upon histological subtyping of ovarian lesions a careful search to rule out endometrial pathology should also be made. Keeping in mind the relatively isolated geographic location of the place of study, poverty and illiteracy awareness among public and doctors will be helpful particularly in case of young females presenting with ovarian mass and a possibility of malignancy ruled out.

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**Declarations:** (1) The article is original with the author(s) and does not infringe any copyright or violate any other right of any third parties; (2) The article has not been published (whole or in part) elsewhere, and in any form, except as provided herein; (3) All author(s) have contributed sufficiently in the article to take public responsibility for it and (4) All author(s) have reviewed the final version of the above manuscript and approve it for publication.

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## ORIGINAL PAPER

# Effectiveness of structured teaching programme on knowledge regarding cord blood banking among staff nurse

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## ABSTRACT

**Introduction:** Umbilical cord blood is rich in stem cells, which are the building blocks of blood and the immune system.

**Objectives:** The study had been undertaken to determine the effectiveness of structured teaching programme (STP) regarding cord blood banking. **Methods:** A pre-experimental design (one group pre test post test design) was undertaken in Gauhati Medical College and hospital, Guwahati Neurological research centre, Good health hospital, Central nursing home, Assam. The sample size consists of 60 staff nurses and convenient sampling technique was used. The items assessed the knowledge of samples regarding cord blood banking and it consists of 30 questions. **Results:** Out of 60 samples, in pre-test majority 43 (72%) of respondents had Inadequate knowledge and remaining 17(28%) of the respondents had moderately adequate knowledge. After the administration of structured teaching programme, in post-test majority 38(63%) of the respondents had moderately adequate knowledge and remaining 22(37%) had adequate knowledge regarding cord blood banking the mean knowledge score in pre-test is 11.47 with standard deviation 3.52. In post-test, the mean knowledge score is 22.07 with standard deviation 2.48. The calculated value of “Z” 19.08 is higher than the tabulated value 2.33 at 0.05% of level of significant. So it indicates that the mean posttest knowledge is significantly higher than the mean pretest knowledge. Hence, STP on cord blood banking is effective.

**Conclusion:** The STP was effective in enhancing the knowledge of health professionals regarding umbilical cord blood stem cells collection, preservation and utilization and the teaching programme had a role in improving the knowledge of the health professionals.

**Keywords:** Quasi experimental study, hospital, umbilical cord blood

## INTRODUCTION

A stem cell is a cell that can become establishes in an appropriate

growing environment, has the ability to multiply, can produce cell types that continue to differentiate and renew itself or ensure the continuation of its own population and can regenerate tissue with functional damage. Stem cells, which have been used for a period of time in the treatment of leukemia and other types of cancer, have recently started to be used in medicine development, and this progress offers to hope for the treatment of diabetes, cardiovascular and neurogenerative diseases, but these applications are still unproven.<sup>1,2</sup> Stem cell transplantation has traditionally been performed utilizing bone marrow or peripheral blood as a source of hematopoietic stem cells, but in many circumstances, stem cells from umbilical cord blood are preferable, given a lower risk of graft vs. host disease, greater human leukocyte antigen mismatch tolerance, lower costs, less infectious morbidity, more expeditious time to obtainment and nonexistent risk to the donor.<sup>3</sup>

Umbilical cord is the essential vitalizing, direct interlink between a mother and her child, which is always depicted as the blood relationship and an emotional bonding of motherhood. After a baby is born and the umbilical cord is cut, some blood remains in the blood vessels of the placenta and the portion of umbilical cord remains attached to it. This is referred to as cord blood. This particular blood contains numerous hematopoietic stem cells, which differentiates into other cells and transforms into any organ and the ability to self-degenerate.<sup>4</sup> Nurses need to understand stem cell sources so they can enter the debate on this issue. Discussions are often intense because of the different positions held by scientific, religious, social and political sources. Nurses need to equip themselves with accurate information, using the

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international Council of Nursing Code of Ethics for Nurses<sup>5</sup> and their own ethical decision- making processes. They can then make decisions for themselves about the efficacy of stem cell research and then become important sources of knowledge and information to help others understand and debate the direction of this scientific break through.<sup>6</sup>

So, nurses need to be educated regarding the value of collecting and preserving umbilical cord blood stem cells for future use in treating illnesses such as cancer, leukemia, and blood and immune disorders.

**Objectives:** 1. To assess the knowledge regarding cord blood banking among staff nurses before and after administration of structured teaching programme.

2. To evaluate the effectiveness of structured teaching programme regarding cord blood banking.

3. To find out the association between knowledge score with selected demographic variables among staff nurses.

**Hypothesis H<sub>1</sub>:** There will be a significant difference in the mean knowledge score of staff nurses regarding cord blood banking before and after structured teaching programme.

## METHODS

A pre-experimental design (one group pre test post test design) was used to assess the effectiveness of Structured Teaching Programme on Knowledge regarding cord blood banking among the staff nurses of selected hospitals of Guwahati, Assam. The study was conducted in four hospitals of Guwahati, these are Gauhati medical college and hospital, Guwahati Neurological research centre (GNRC), Good health hospital, Central nursing home, Guwahati, Assam. The four hospitals were selected because of availability of sample, feasibility of conducting study and being permitted by the hospitals authority for the investigator. In this study, the target population was the staff nurses working on maternity ward, labour room, gynea and obstetric operation theater in selected hospitals of Guwahati, Assam, who fulfilled the inclusion criteria. The sample size consists of 60 staff nurses of selected Hospital of Guwahati, Assam. Non probability convenient sampling technique was used in selecting the sample. The convenient sampling technique was adopted because most of all the staff nurses were busy in their daily duty and permission for conducting the study was not permitted by many hospitals and also study was done as per the convenient of the researcher. A Structured questionnaire was developing to assess the level of knowledge of the staff nurses regarding cord blood banking. The technique used for this study was self report. The STP on cord blood banking was developed and an outline reference was made on the various topics that were covered in the structured teaching programme. The draft was validated by experts comprising of seven nursing experts, and three medical experts. The experts were requested to give their valuable opinion and suggestion.

The tools used for the study consisted of two (2) sections.

## Section I Demographic Profile

The items assessed the demographic data of samples like age in years, educational qualification, religion, years of experience,

marital status, monthly income, any special training attended.

## Section II Structured Questionnaire

The items assessed the knowledge of samples regarding cord blood banking and it consists of 30 questions. Each question had only one correct answer. For every correct response a score of '1' (one) mark was given and for every incorrect response a score '0' (zero). Hence, the maximum score on knowledge was 30 and minimum score was '0'. To interpret the level of knowledge, the scores were converted into percentage and were categorized as follows:

- Inadequate knowledge <50% (Score<10 marks)

- Moderately adequate knowledge 50-75% (score 10-20marks)

- Adequate knowledge >75% (score 20-30 marks)

The reliability of the tool has been done by using Split half method for reliability. The reliability of knowledge was 0.87, so it was found to be reliable. Before starting the final data collection procedure for the present study, the investigator obtained permission from the Ethical Committee INS Trust (GNRC), Dispur, and Guwahati, Assam. The data collection period was scheduled from 4<sup>th</sup> July to 30<sup>th</sup> July 2016. A formal written permission was obtained from the respective authorities of the selected hospitals. The data analysis was consisted of descriptive and inferential statistics.

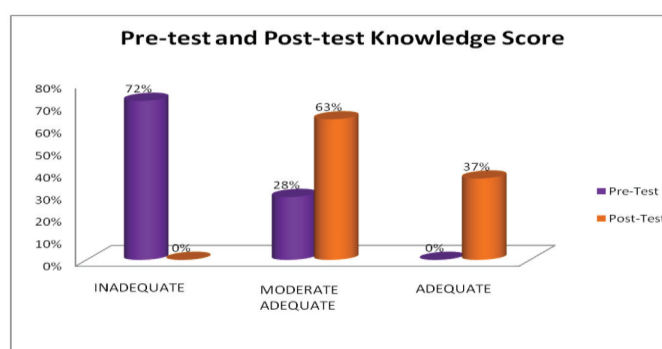
## RESULTS

The data were grouped and analyzed under the following sections.

### Section I Frequency and percentage distribution of staff nurses according to demographic characteristics

Out of 60 samples, majority 29(48%) of the respondents were in the age groups of 25-30 years, another 21(35%) of the respondents were above 31 years and 10(17%) of respondent were in 20-24 years. Out of 60 samples, majority 43(72%) of the respondents were GNM. Forty one (68%) of the respondents was Hindu. Majority 45(75%) of the respondents had 1-5 years of work experience. Thirty six (60%) of the respondents were married. Fifty five (92%) of the respondents had not attended any training related to cord blood banking.

### Section II Assesment of knowledge regarding cord blood banking among staff nurses before and after administration of structured teaching programme.



**Figure 1** Distribution of staff nurses according to their level of knowledge



The data presented in figure I depicts that, out of 60 samples, in pre-test majority 43(72%) of respondents had Inadequate knowledge and remaining 17(28%) of the respondents had moderately adequate knowledge. After the administration of structured teaching programme, in post-test majority 38(63%) of the respondents had moderately adequate knowledge and remaining 22(37%) had adequate knowledge regarding cord blood banking.

**Table 1** Knowledge of staff nurses regarding cord blood banking

n=60				
Variable	Total score	Range of scores	Mean	SD
Pre-test Knowledge	30	5 – 15	11.47	3.52
Post-test Knowledge	30	18-27	22.07	2.48

The data presented in Table -1 shows the comparison of values of overall knowledge of the staff nurses before and after administration of structured teaching programme with mean = 11.47, SD = 3.52, range from 5 to 15 during pre-test and mean = 22.07, SD = 2.48 and range from 18-27 during post-test.

### Section III Evaluation of effectiveness of structure teaching programme on knowledge regarding cord blood banking among staff nurses

**Table 2** Evaluation of effectiveness of structured teaching programme

n=60					
knowledge	Mean	SD	P-Value	Calculated Z- value	Table Z-value
Pre-test	11.47	3.52	0.05	19.08	2.33
Post-test	22.07	2.48			

**Table 2** depicts that, the mean knowledge score in pre-test is 11.47 with standard deviation 3.52. In post-test, the mean knowledge score is 22.07 with standard deviation 2.48. The improvement is statistically tested by Z test. The calculated value of “Z” 19.08 is higher than the tabulated value 2.33 at 0.05% of level of significant. Therefore,  $H_1$  is accepted. So it indicates that the mean posttest knowledge is significantly higher than the mean pretest knowledge. Hence, STP on cord blood banking is effective.

### Section IV Association of pre-test knowledge with selected demographic variables.

**Educational Qualification:** The calculated value was 7.07 and table value was 3.84 at 0.05 level of significant. Since the calculated value was greater than table value there was significant association between knowledge and educational qualification.

**Religion:** The calculated value was 2.6 and table value was 5.99 at  $p = 0.05$  level of significant. Since the calculated value was less than table value there was no significant association between knowledge and religion.

**Years of Experience:** The calculated value was 6.59 and table value was 3.84 at  $p = 0.05$  level of significant. Since the calculated value was greater than table value there was significant association between knowledge and years of experience.

**Marital Status:** The calculated value was 0.01 and table value was 3.84 at  $p = 0.05$  level of significant. Since the calculated value was less than table value there was no significant association between knowledge and marital status.

### DISCUSSION

The first objective was to assess the knowledge regarding cord blood banking among the staff nurses before and after the administration of structured teaching programme.

In pre-test, 43(72%) of respondents had inadequate knowledge and remaining 17(28%) had moderately adequate knowledge regarding cord blood banking. In post-test, 22(37%) had adequate knowledge and remaining 38(63%) had moderately adequate knowledge regarding cord blood banking.

The present study was supported by the study conducted by P. Devadas<sup>7</sup> and the study found that 84% of health professionals had inadequate knowledge and 16% had neutral attitude. So it is necessary to update the health professionals on latest trends and developments in Knowledge and Technology so that they give correct information to the clients. Similar findings were reported by R. Taylor,<sup>8</sup> who found most of the nurses had good knowledge (42.86%) and neutral attitude (78.6%) with a mean knowledge and attitude score of  $16.84 \pm 4.59$  and  $53.75 \pm 8.26$  respectively.

**The second objective was to evaluate the effectiveness of structured teaching programme regarding cord blood banking among college staff nurses.**

The mean post-test knowledge score 22.07 with standard deviation 2.48 was significantly higher than mean pre-test knowledge scores 11.47 with standard deviation 3.52 among the staff nurses regarding cord blood banking. The improvement was significantly tested by “Z” test. The calculated value of “Z” was,  $Z = 19.08$  at 0.05 level of significant.

The present study was supported by the study conducted by Kumaraswamy S, Muthulakshmi P<sup>4</sup> and the study results showed that post-test score (mean:  $39.6 \pm 2.57$ ) was higher than that of pre-test score (mean:  $13.23 \pm 3.88$ ) they concluded that the STP was effective in enhancing the knowledge of health professionals regarding umbilical cord blood stem cells collection, preservation and utilization and the teaching programme had a role in improving the knowledge of the health care personnel. Similar study was conducted by Ujala Joshi, Gopal Singh Charan, Lalita Kumari<sup>9</sup> and the results revealed that pre test knowledge level of nurses (45%) had average knowledge, (26.7%) had good knowledge, (20%) had below average and only (8.3%) had excellent knowledge. In posttest knowledge level of nurses (65%) had excellent knowledge, (28.3%) had good knowledge and only (6.7%) had average knowledge regarding umbilical cord stem cell collection, preservation and utilization among nurses.

A study was conducted by Catherine Edwin Francis, Deenajothy R, Hemamalini M, Titus Immanuel D C<sup>10</sup> and the results revealed

that after giving structured teaching programme on stem cells and cord blood banking, none of the mothers are having inadequate knowledge score, 28.0% of them are having moderate knowledge score and 72% of them are having adequate score.

### CONCLUSION

In pre-test majority of the respondents 43(72%) had inadequate knowledge and 17(28%) had moderately adequate knowledge regarding cord blood banking. After intervention, in post-test majority of the respondents 38(63%) had moderately adequate knowledge and 22(37%) have adequate knowledge. The mean of pre-test knowledge were 11.47 respectively. After intervention the mean of post-test knowledge were 22.07 respectively. The calculated value of “Z” of knowledge 19.08 respectively was highly significant at 0.05 % level. There was significant association between pre-test knowledge with the selected demographic variables like educational qualification, years of experience.

Thus, Structured Teaching Programme was effective in improving the knowledge of staff nurses regarding cord blood banking. Structured Teaching Programme can be used as mass education in hospitals to create awareness among the staff nurses regarding importance of cord blood banking.

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**Conflict of interest:** None declared.

**Ethical clearance:** Institutional Ethical committee clearance was obtained before beginning the study

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**Declaration:** The article is original with the author(s) and does not infringe or violate any other right of any third parties. The article has not been published (whole or in part) elsewhere, and is not being considered for publication elsewhere in any form, except as provided herein. All authors have contributed sufficiently in the article to take public responsibility for it. All authors have reviewed the final version of the above manuscript and approve it for publication.

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## ORIGINAL PAPER

# Gender prediction: anthropometric study of mastoid process and foramen magnum

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## ABSTRACT

**Introduction:** Sex determination of human skeletal remains is considered as an initial step in identification. Sex determination of fragmented skeletal remains has immensely helped in identification of an individual. Foramen Magnum is an integral component of studies on skull in particular interest for anthropology, anatomy, forensic medicine, and other medical fields. **Objectives:** The aim of this study was to evaluate the use of mastoid process and foramen magnum measurements as a tool for sex determination in unidentified skeleton. **Methods:** Seventy seven completely undamaged skulls of known sex in book record were used for the study. Adult crania (age ranges between 20 -70 years) of known sex were obtained from various sources. Adult skulls of mature individuals, without destruction of mastoid process in the region of the craniometrical points, were chosen for the study. Skulls that showed evidence of injury/fracture or deformity were excluded from this study. A measurement of the mastoid and foramen magnum was done as per Moore-Jansen et al. 1994, using vernier/ sliding calipers (0.01mm) and craniophore. Analysis was done using IBM – Statistical Package for Social sciences (SPSS) version 21. The means between the male and female samples were compared for significance using the Student's t – test. **Results:** Out of the 77 skulls studied, 45 were male and 32 were females. In male, mastoid length mean is 2.82, whereas in female it is 2.51. In male the mastoid width mean is 1.57 and in female is 1.38. Statistics revealed high significance in mastoid length and mastoid width (p value: 0.01 and 0.012 respectively). Mastoid index did not show much significance. **Conclusion:** Our study revealed statistically significant parameters ( $p < 0.05$ ) in mastoid length and mastoid breadth. Reports on the use of mastoid process and foramen magnum as a tool for sex determination in unidentified human skeleton has been reported in different populations.

**Keywords:** Sex determination Mastoid length, Sexual dimorphism, South Indian population

## INTRODUCTION

Sex determination of human skeletal remains is considered as an initial step in identification. In cases of fragmented or mutilated body, it is difficult to identify the body. Sex determinations of such skeletal remains have immensely helped in identification of an individual. This skilful process is carried out by forensic and anatomy experts.

Anthropometry which aids the understanding<sup>1</sup> of anatomical structures constitutes the technique of expressing quantitatively, the form of human body and skeleton. Almost all bones of the human skeleton show some degree of sexual dimorphism.<sup>2-4</sup> Sex of the person can be determined using pelvis if cranium is not available for study. In cases where entire skull is not found, mastoid plays an important role in sex determination as it is the most dimorphic bone of skull.<sup>5</sup> The mastoid region, a fragmentary piece of the skull, is ideal for sex determination as it is resistant to damage due to its anatomical position at the base of skull and its toughness.

Hence we performed this study to evaluate the use of mastoid process and foramen magnum measurements as a tool for sex determination in unidentified skeleton.

## METHODS

Adult crania (age ranges between 20 and 70 years) of known sex were obtained from the archives of the Department of Forensic Medicine and Toxicology and Department of Anatomy from

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Tagore Medical College & Hospital and Sri Ramachandra Medical College & Research Institute, Chennai, Tamil Nadu and also from Anthropology Department Sri Venkateshwara University, Tirupathi, Andhra Pradesh. Adult skulls of mature individuals, without destruction of mastoid process in the region of the craniometrical points, were chosen for the study. Skulls that showed evidence of injury/fracture or deformity were excluded from this study. Measurements for all crania were taken by the same person twice but at different sittings after formal training. Their average was then used in data analysis. Each cranium was placed on a flat surface and the measurements were taken from a particular landmark. Measurements of the mastoid and foramen magnum was done as per the method of Moore-Jansen, et al. 1994.<sup>6</sup>

The following measurements were taken:

**Cranial length:** Maximum cranial length was measured by using spreading calliper from glabella to opisthocranium.

**Cranial breadth:** At right angle to mid-sagittal plane, maximum breadth was taken above the level of mastoid crests with spreading calliper.

**Cranial index:**  $\frac{\text{Maximum Cranial breadth}}{\text{Maximum Cranial length}} \times 100$

**Basion (ba):** The midline point on the anterior margin of the foramen magnum. (Fig. 1)

**Opisthion (o):** The midline point at the posterior margin of the foramen magnum. (Fig. 1)

**Foramen Magnum Length (ba-o):** Direct distance from basion (ba) to opisthion (o).

Tips of caliper should rest precisely on opposing edges of the border of foramen magnum.

**Foramen Magnum Breadth:** Distance between the lateral margins of foramen magnum at the points of greatest lateral curvature. (Fig. 1)

**Foramen magnum Index:**  $\frac{\text{Foramen Magnum Breadth}}{\text{Foramen Magnum Length}} \times 100$

**Mastoid Length:** vertical projection of the mastoid process below and perpendicular to the eye-ear (Frankfort) plane (Fig. 2).

**Mastoid Width:** From the incisura mastoidea to a corresponding level on the external surface of the process, transversely with reference to the process itself and perpendicular to the incisura mastoidea.<sup>7</sup>

**Mastoid index:**  $\frac{\text{Mastoid width}}{\text{Mastoid length}} \times 100$

#### DATA MANAGEMENT AND ANALYSIS

Analysis was done using IBM – Statistical Package for Social

sciences (SPSS) version 21. The means between the male and female samples were compared for significance using Student t-test. Level of significance was fixed at  $p < 0.05$ .

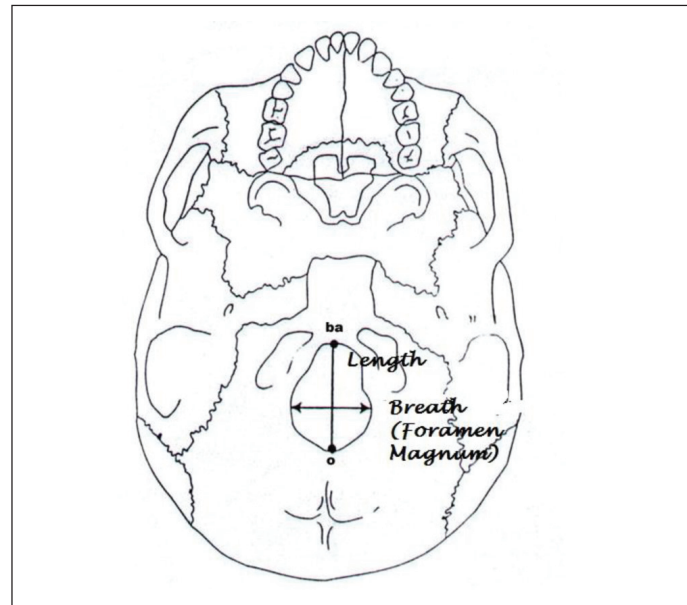


Figure 1 Foramen Magnum

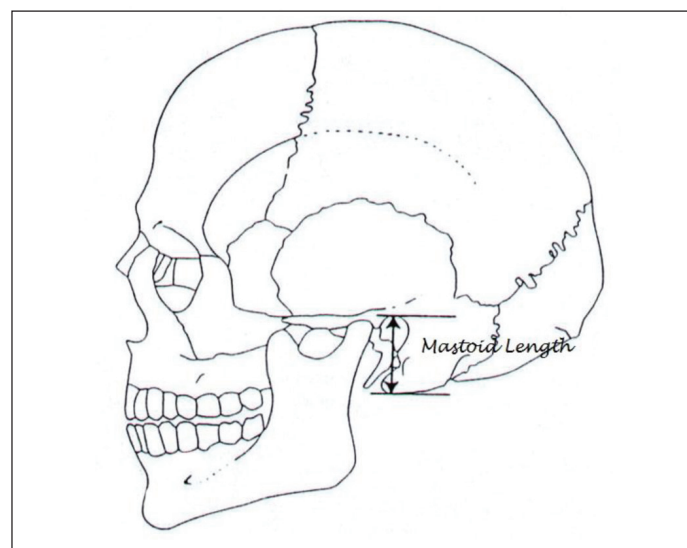


Figure 2 Mastoid Length

#### RESULTS

Out of the 77 skulls studied, 45 were male and 32 were females. Among the total population the mean Cephalic Index (C.I) was  $71.51 \pm 5.3$ . The C.I was higher among the male subjects as compared to the females. Among the male subjects, the C.I ranged between 60.57 and 84.8 (mean  $71.75 \pm 5.31$ ). The female C.I ranged between 59.3 and 88.7 (mean  $71.51 \pm 8.02$ ) as shown in Table 1.

Table 1 Various parameters of cranium

Sex	Mean	N	Standard deviation (SD)	Standard error of mean (SEM)	Maximum	Minimum	T value	P value
Male	71.75	45	5.319	.792	84.80	60.57	0.373	0.009
Female	71.18	32	8.029	1.419	88.70	59.30		
Total	71.51	77	6.539	.745	88.70	59.30		

**Table 2** Various parameters of Mastoid process

Parameters	Gender	no	Minimum	Maximum	Mean	S.D	S.E	T value	P value
Mastoid length	Male	45	2.1	3.7	2.82	0.38	0.05	3.47	0.01*
	Female	32	1.7	3.3	2.51	0.37	0.06		
Mastoid width	Male	45	0.9	2.4	1.57	0.35	0.05	2.57	0.012*
	Female	32	.92	1.8	1.38	0.25	0.04		
Mastoid index	Male	45	26.1	92.3	57.16	16.24	2.42	.23	0.8
	Female	32	35.6	94.1	56.32	14.02	2.47		

\*p&lt;0.05 - statistically significant

There is significant difference in mastoid length and width among male and female ( $p<0.05$ ). There is no significant correlation between mastoid index and cephalic index. The length of mastoid

process in males and females was found to be  $2.82 \pm 0.38$  and  $2.51 \pm 0.37$  respectively. Mastoid index was found to be  $57.16 \pm 16.24$  and  $56.32 \pm 14.02$  in males and females respectively as shown in **Table 2**.

**Table 3** Various parameters of Foramen Magnum

Parameters	Gender	no	Minimum	Maximum	Mean	S.D	S.E	T value	P value
FM length	Male	45	2.70	4.20	3.48	.28	.04	2.08	0.62
	Female	32	3.00	3.90	3.36	0.28	0.04		
FM breadth	Male	45	2.4	4.1	2.864	.29	0.04	0.86	0.59
	Female	32	2.46	3.6	2.78	0.26	0.04		
FMI	Male	45	66.67	122.22	82.5	9.33	1.39	0.77	0.02*
	Female	32	71	120	83.12	9.87	1.7		

\*p&lt;0.05 statistically significant

**Table 4** Comparisons of findings of present study with others

Authors and years	Antero posterior diameter (cm)	Transverse diameter (cm)
Coin and Malkasian, 1971 <sup>8</sup>	3.4	2.9
Sayee, et al., 1987 <sup>9</sup>	3.4	2.8
Berge and Bergmann, 2001 <sup>10</sup>	3.3	2.8
Kizilkant, et al., 2006 <sup>11</sup>	3.4	2.9
Deshmukh and Devershi, 2006 <sup>12</sup>	3.4	2.9
Damiani, et al., 2012 <sup>13</sup>	3.4	2.8
Raghavendra, et al., 2012 <sup>14</sup>	3.5	2.8
Radhakrishna, et al., 2012 <sup>15</sup>	3.4	2.8
Singh and Talwar, 2013 <sup>16</sup>	3.3	2.7
Muralidhar, et al., 2014 <sup>17</sup>	3.3	2.8
Our study, 2016	3.4	2.9

The length and breadth of foramen magnum was more in male than in females as shown in **Table 3**. But the Foramen magnum index (FMI) was observed to be surprisingly more in females ( $83.12 \pm 9.87$ ) than in males ( $82.5 \pm 9.33$ ) and was statistically significant ( $p<0.05$ ). The mean FMI of the study population was  $83.28 \pm 10.4$  as shown in **Table 3**.

## DISCUSSION

Skull is an important tool for identification purpose. With the help of Moore-Jansen et al<sup>6</sup> parameters, measurements of mastoid process of skull of known sex were taken.

The length of mastoid process in males and females was found to be  $2.82 \pm 0.38$  and  $2.51 \pm 0.37$  respectively. Mastoid index was

found to be  $57.16 \pm 16.24$  and  $56.32 \pm 14.02$  in males and females respectively **Table 2**.

The length and breadth of foramen magnum was more in male than in females as shown in **Table 3**. But the FMI was observed to be surprisingly more in females ( $83.12 \pm 9.87$ ) than in males ( $82.5 \pm 9.33$ ) and was statistically significant ( $p<0.05$ ). The mean FMI of the study population was  $83.28 \pm 10.4$  as shown in **Table 3**. Comparisons of foramen magnum (male) dimensions in various studies with our study are shown in **Table 4**.

## CONCLUSION

In this study, we evaluated the use of mastoid process and foramen magnum measurements as a tool for sex determination in unidentified skeleton. Our findings revealed statistically significant parameters ( $p<0.05$ ) in mastoid length and mastoid breadth. Foramen magnum length and breadth did not show statistical significance in regard to sexual dimorphism. Observations of various authors suggest that the results obtained by our study are similar to their studies, and these parameters can be used in fragmentary remains also. We conclude that these parameters can be used in sex determination and can be used as a baseline data for anthropometric study.

**Conflict of interest:** None declared.

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**Contribution of authors:** We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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## ORIGINAL PAPER

# Inguinal hernia – a clinical study

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### ABSTRACT

**Introduction:** Hernias are among the oldest known afflictions of mankind and surgical repair of the inguinal hernia is the most common general surgery procedure performed. **Aim:** The objectives of this study are to study the incidence and different modes of presentation of inguinal hernia and its best possible management with an idea of preventing the recurrence and minimizing other post-operative complications. **Methods:** 137 cases of inguinal hernia admitted from June 2013 to May 2014 in Gauhati Medical College and Hospital, Guwahati were selected randomly for this study. Patients below 12 years were excluded from the study. The data was analysed using standard statistical methods. **Results:** Incidence of inguinal hernia was highest in the 6<sup>th</sup> decade with male to female ratio of 44.6:1. Indirect hernia was the commonest type 20.54 % were complicated inguinal hernias. Incidence was more common in those engaged in hard and strenuous work. Smoking was associated with 64.9% of patients. Lichtenstein mesh repair was done in 105 hernias, herniotomy in 6 and laparoscopy in 5 cases. Post-operatively minor complications were encountered and managed accordingly. One recurrence was noted in Bassini's repair. **Conclusion:** Inguinal hernia is a common condition which can affect any age group and both sexes, with a higher incidence seen in males and in the age group 51-60 years. Its incidence is more common in occupation involving strenuous work. Smoking is an important risk factor. Lichtenstein mesh repair is the standard method of repair with fewer complications and is cost effective.

**Keywords:** Direct hernia, indirect hernia, recurrent hernia, Lichtenstein mesh repair, Herniorrhaphy

### INTRODUCTION

Hernia is a common condition afflicting both men and women since time immemorial. Surgical repair of the inguinal hernia is the most common general surgery procedure performed today.<sup>1</sup> The word “hernia” is derived from a Latin term meaning “a rupture”. Hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls.<sup>2</sup> Majority of abdominal wall hernias occur in the groin approximately 75% of

the total incidence.<sup>3</sup> Of all groin hernias, 95% are hernias of the inguinal canal. Inguinal hernias are nine times more common in men than in females.<sup>1</sup> Inguinal hernias may be congenital or acquired, with the latter being more common. Essentially any risk factor that either increases intra-abdominal pressure or weakens the anterior abdominal wall may lead to the formation of an inguinal hernia.<sup>4</sup> Complications of inguinal hernia are irreducibility, obstruction and strangulation. In these cases, emergency surgery is required. Inguinal hernia repair has made enormous progress throughout the ages. The main reason for intervention however remained the same, continuous growth of inguinal and scrotal swelling or the risk of incarceration of the hernia content and the bad results of conservative methods like truss placement. Surgical techniques have rapidly evolved since Eduardo Bassini in 1884 proposed his first successful reconstruction of the inguinal floor. The idea was to decrease the recurrence. The success of the Bassini repair over any of its predecessors ushered in an era of tissue-based repairs. The tension free repair introduced by Irving Lichtenstein, caused a dramatic drop in the recurrence rate and became the procedure of choice.<sup>5</sup>

With the advent of minimally invasive surgery, inguinal hernia repair underwent its most recent transformation. These methods became equally accepted for inguinal hernia, providing a technique that has decreased post-operative pain and improves recovery aspects. Further more, an array of prosthetic materials has been introduced to further lower recurrence rates and provide the patient with the utmost quality of life.<sup>3</sup>

**Objectives:** 1. To study the clinical presentations of inguinal hernia.

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2. To study the various forms of presentation of inguinal hernia and their effective management.

3. To know the post-operative complications with the various methods of inguinal hernia repair.

## METHODS

It was a prospective study which included all adult cases of inguinal hernia admitted in various wards in the Department of General Surgery at Gauhati Medical College and Hospital, Guwahati, between the periods from June 2013 to May 2014. Follow up and pre-operative investigations were done on O.P.D. basis.

Patients diagnosed with inguinal hernia by clinical examination were included in the study and patients fewer than 12 years ago were excluded from the study.

## RESULTS

The study is based on 137 patients with inguinal hernia who amongst them had 146 hernias. A total of 146 procedures were done which included the cases with bilateral hernias.

In our study, 134 patients were male and only 3 patients were female with a male to female ratio of 44.6:1. The highest representative group was from 51 – 60 years, with 31 patients, which constitutes 22.6% of the series. The youngest patient was 14 years and the oldest patient was 80 years old. **Table 1** shows the age wise incidence of hernia in our study.

**Table 1** Age distribution of hernia

AGE (YEARS)	NO. OF PATIENTS	PERCENTAGE
< 20	11	8.02 %
21-30	28	20.4 %
31-40	20	14.6 %
41-50	28	20.4 %
51-60	31	22.6 %
61-70	16	11.7 %
71-80	3	2.2 %
Total	137	100 %

The incidence of hernia was highest among the group engaged in hard and strenuous work (agriculturist, labourers and rickshaw pullers) accounting for 76.7% of cases. **Table 2** shows the incidence of hernia in relation to different occupation.

**Table 2** Incidence of hernia in relation to occupation

OCCUPATION	NO. OF CASES	PERCENTAGE
Agriculturists	53	38.7 %
Labourer	39	28.5 %
Rickshaw puller	13	9.5 %
Driver	6	4.4 %
Office worker	6	4.4 %
Student	6	4.4 %
Tailor	5	3.6 %
Electrician	4	2.9 %
Plumber	3	2.2 %
Teacher	2	1.4 %
Total	137	100 %

Swelling alone was the most common mode of presentation accounting for 58.21% of all hernias. 30(20.54%) patients presented with complicated hernia in the emergency. **Table 3** shows different modes of presentation of inguinal hernia.

**Table 3** Clinical presentation of hernia

SYMPTOMS	POSITION		TOTAL	PERCENTAGE
	RIGHT	LEFT		
Swelling	56	29	85	58.21 %
Pain	2	0	2	1.36 %
Pain And Swelling	20	9	29	19.86 %
Irreducibility	14	3	17	11.64 %
Features Of Obstruction	8	1	9	6.16 %
Features Of Strangulation	3	1	4	2.73 %
Total	104	44	146	100

Smoking was associated with majority of cases accounting for 89(64.9%) out of 137 patients. Incidence of hernia was more common in the patients who undertook strenuous work accounting for 62.7% alone and along with other factors it constitutes 74.3 %. Other precipitating factors were constipation, COPD and Benign Prostatic Hyperplasia. **Table 4** shows the various precipitating factors associated with inguinal hernia.

**Table 4** Precipitating factors associated with inguinal hernia

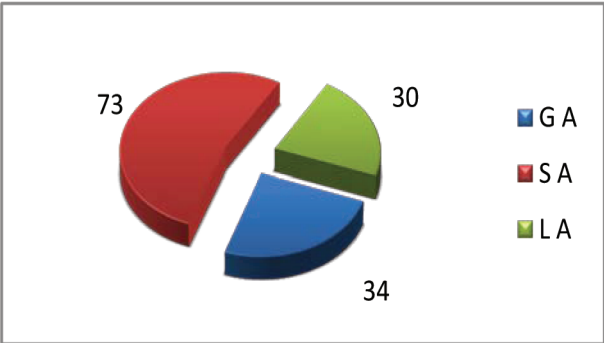
FACTORS	FREQUENCY	PERCENTAGE
Strenuous work	86	62.7%
COPD	3	2.2%
Constipation	6	4.4%
BPH	4	2.9%
COPD and strenuous work	5	3.6%
Constipation and strenuous work	6	4.4%
BPH and strenuous work	5	3.6%
Delivery	2	1.4%
None	20	14.6%
<b>Total</b>	<b>137</b>	<b>100%</b>

Indirect inguinal hernia was the most common type seen accounting for 118(80.82 %) cases with the incidence on right side being more common than the left. **Table 5** shows the incidence of different types of hernia in relation to side.

**Table 5** Incidence of different types of hernia in relation to side

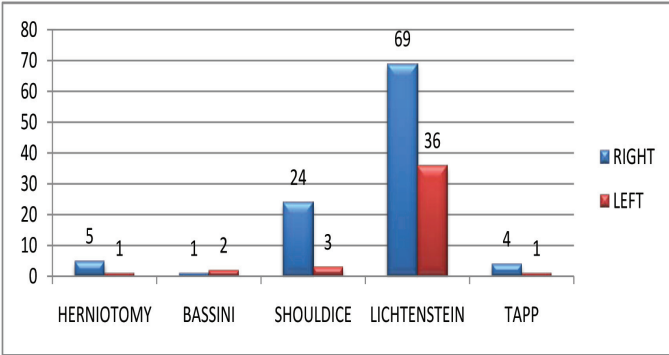
TYPE	FREQUENCY		TOTAL	PERCENTAGE
	RIGHT	LEFT		
Indirect	86	32	118	80.82 %
Direct	14	10	24	16.43 %
Recurrent	1	0	1	0.68 %
Pantaloon	2	1	3	2.05 %
TOTAL	103	43	146	100 %

Spinal an anesthesia was most commonly used accounting for 53.3% of cases. **Fig. 1** shows the type of anesthesia used.



**Figure 1** Anesthesia used

The method of repair was largely determined by the individual surgeon’s preference. Lichtenstein tension free mesh repair was the preferred method of repair. Out of 107 patients with uncomplicated hernias, 98 cases presented with unilateral inguinal hernias and 87 of these patients underwent Lichtenstein mesh repair while herniotomy was done in 6 patients and 5 patients underwent laparoscopic procedure (TAPP) and 9 cases presented with bilateral inguinal hernias and all of them underwent Lichtenstein mesh repair on both sides. Herniorrhaphy was done for all the 30 cases of complicated inguinal hernias. **Fig. 2** shows the various surgical procedures employed.



**Figure 2** Bar diagram showing the various surgical procedures

10 patients of Herniorrhaphy and 11 patients of Lichtenstein group had severe pain post-operatively. 1 patient of Herniorrhaphy, 6 patients of Lichtenstein and 1 patient of Laparoscopy group had pain-free post-op period. Other post-operative complications associated with the operative procedure are shown in **Table 6**.

**Table 6** Post-operative complications

COMPLICATIONS	NO. OF PATIENTS
Urinary retention	2
Respiratory complication	3
Wound infection	7
Hematoma	2
Seroma	4
Chronic groin pain	5
Recurrence	1

Hospital stay ranges from 5-18 days and the mean hospital stay was 5.5 days. The longest stay was 18 days in a case of strangulated hernia with wound infection. The minimum stay was 3 days in a patient with laparoscopic repair. All the patients, at the time of discharge, were advised to attend the surgery outdoor at 3 weeks, 6 weeks and 6 months after discharge.

**DISCUSSION**

Inguinal hernia is one of the commonest problems of mankind. Since the period of Hippocrates (4<sup>th</sup> century BC) the disease has been known and various palliative treatment methods were adopted. Innumerable procedures have been described for this common disease but no one is exempted from complications hence surgery on hernia is still a challenging subject. Watson said “in the entire history of surgery, no subject has been as controversial as the repair of groin hernias”.<sup>6</sup>

In the present study, hernia was found to be more common in males as compared to females. Moreover smoking was found to be an important risk factor along with occupation involving strenuous work. Many risk factors like smoking which may cause chronic cough, obstructive urinary symptoms due to prostatomegaly, straining during defecation and chronic constipation lead to hernia formation, and recurrence rate of hernia increases if these risk factors are not adequately controlled prior to surgical correction of hernia. Also, a stronger repair is indicated in presence of such risk factors.

Indirect inguinal hernia was the most common variety of inguinal hernia with right-sided hernia being more common than the left side.

Hernia repair can be done in spinal, general or local anaesthesia. Local anaesthesia is more preferable for patients with co-morbid conditions not fit for spinal or general anaesthesia. Although there are number of techniques for repair of hernia, Lichtenstein tension free mesh repair of hernia is the most preferred method. It offers the effective repair that overcomes many of the problems. It is relatively easier and less technically demanding than other anatomical repairs like Bassini’s/Shouldice’s repairs and easy to learn. Median length of operation is shorter than the other techniques. Infection rate in mesh repair is comparatively less compared to tissue repair with less hospital stay and early return to work. Compared to conventional tissue repair, the mesh repair had relatively less complications in the present study. Tissue repair are usually helpful in complicated cases like strangulation where chances of infection with prosthetic mesh is more. Lichtenstein tension-free mesh repair has become the standard method of hernia repair and is easier to learn that takes less time and results in fewer recurrences.

Laparoscopic repair for inguinal hernia provides less post-operative pain, less hospital stay and good cosmesis but is technically demanding procedure with longer learning curve and is expensive as compared to conventional mesh repair.

**CONCLUSION**

Inguinal hernia is a common condition which can affect any group and both sexes, with a higher incidence seen in age group 51-60 years and in males. Incidence of inguinal hernia is more common



in occupation involving hard and strenuous work and is frequently associated with conditions that cause persistent increase in intra-abdominal pressure. Smoking is found to be an important risk factor associated with inguinal hernia. Surgery is the mainstay in treatment of inguinal hernias. Correction of precipitating factors is important for successful outcome. Lichtenstein mesh repair is the commonest procedure under taken. An ideal hernia repair should be durable, with low level of morbidity, allow rapid return to work or recreational pursuits and should be cost effective and with low recurrence rate.

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## ORIGINAL PAPER

# Age determination from radiological study of epiphysial appearance and union of distal end of tibia

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## ABSTRACT

**Introduction:** The bones of human skeletons develop from separate ossification centers. From these centers ossification progresses till the bone is completely formed. These changes can be studied by means of X-rays and these changes are age related. It is therefore possible to determine the approximate age of an individual by radiological examination of bones till ossification is complete. **Methods:** This roentgenographic study was carried out with the objective to assess the general skeletal maturity of distal end of Tibia, of subjects in Mumbai region. 208 males and 68 females between age group of 3-25 years attending the outpatient department of this hospital are selected. Age confirmed from history and noting the birth dates. The cases selected after ruling out the nutritional, developmental, and endocrinal abnormality which affects the skeletal growth. Data analysis was done in P4 computer using HPSS software. **Result:** In Present study Distal end of Tibia, the complete union of epiphysis is seen by 16-18 years in males(16%) and 14 -16 years in females(18.4%). **Conclusion:** At the end conclusions were drawn which are compared with available results of various previous studies.

**Keywords:** X-Ray, ossification centre, epiphysial cartilage

## INTRODUCTION

To establish exact identity of an individual age determination is essential not only in cases of living but also for the dead too. Age has to be determined not only for identification purpose but also for various civil and criminal purposes.<sup>1</sup> The determination of age presents a task of considerable importance from the viewpoint of the administration of justice. It is not possible to enunciate a hard and fast rule for age determination from this union for the whole India because India is composed of areas which differ in climatic, dietetic and disease factors which affect skeletal growth. Determination of the age of an individual from the appearance and the fusion of the ossification centers is a well accepted fact in the field of medical and legal professions.<sup>2</sup>

The present study was carried out to study roentgenographically the epiphysial union of Distal end of Tibia in subjects between age group of 3 to 25 years in males and 3 to 23 years in females attending outpatient department of this hospital. Until the teenage years, the diaphyses of the long bones are separated from their epiphyses on both the ends. There are hundreds of ossification centers in the bones of the body. The appearance and fusion of some centers in the bones with others of the same bones form the basis of estimation of age. The long bones of lower limb play a vital role in assessment of age both in living and dry remains. A wide range of work has been carried out on the estimation of age by this method in various provinces of India as well as foreign country and from that it is clear that there is remarkable variation amongst the data not only in India but also abroad owing to disparities in climatic conditions and socioeconomic status.

## Objectives

- To assess the skeletal maturity of distal end of tibia for a known chronological age in subjects of Mumbai region.
- To comparative study of fusion of distal end of Tibia with known standards.
- To evaluate sex related variation and its correlation with age.
- To know variation if any and exception of fusion of distal end of Tibia.
- To evaluate the medico legal aspects of different ages.
- To suggest any additional radiological investigation to aid and to reduce range in determining age.

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## METHODS

The study was carried out in Grant Medical College and Sir JJ Hospital in Mumbai which is a tertiary referral centre attached to Government Medical College. 208 males and 68 females between age group of 3-25 years attending the outpatient department of this hospital are selected. Age confirmed from history and noting the birth dates. The cases selected after ruling out the nutritional, developmental, and endocrinal abnormality which affects the skeletal growth. X-ray of Distal end of Tibia is taken at department of radio diagnosis. The epiphyses of distal end of Tibia were observed appearance (A) and nonappearance (NA) and different phases of fusion were graded according to Dr. William Sangma<sup>2</sup> and Mckern and Stewart<sup>3</sup> 5 stages as follows:

**Stage 1 (F1):** Non union – when the epiphysal cartilage did not begin to decrease in thickness.

**Stage 2 (F2):** Commence of union – when the thickness of

Skeletal maturity was evaluated radiologically studying Greater Trochanter ossification and the results were compared with the previous known standard studies. Only last two stages of fusion cases were taken in this paper, remaining cases were in early stages of fusion.

## RESULTS

**Fusion of distal end of Tibia in males:** It is clear from **Table 1** that in male subjects in between age group 3 to 12 years cases were seen in F1, F2, and F3 stage of fusion. In between 12-13 years age group 5(10.2%) cases were in F2 stage of fusion and 18.5% cases were in F3 stage of fusion. In 13 to 14 years age group 4.1% cases were in F2 stage of fusion and 25.9% cases were in F3 stage of fusion. In majority of cases in age group 14-15(35%), 15-16(50%) and 16-17(15%) show near fusion (F4), where as in age groups 16-17(3.2%) and 17-18 (12.8%) onwards majority of cases showed complete fusion (F5).

**Table 1** Incidence and extent of fusion of Distal end of Tibia in different age groups in males

Extent of Appearance & fusion	3-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-25	Total
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
F1	18 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	18 (100)
F2	41 (83.6)	5 (10.2)	2 (4.1)	1 (2.0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	49 (100)
F3	10 (37.0)	5 (18.5)	7 (25.9)	5 (18.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	27 (100)
F4	0 (0)	0 (0)	0 (0)	7 (35.0)	10 (50.0)	3 (15.0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	20 (100)
F5	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (3.2)	12 (12.8)	26 (27.5)	11 (11.7)	15 (16.0)	27 (28.7)	94 (100)

epiphysal cartilage was found to be reduced appreciably (1/4<sup>th</sup> united)

**Stage 3 (F3):** Incomplete union – when the epiphysis has begun to fuse with shaft and complete union was well underway (1/2 united)

**Stage 4 (F4):** Complete union – when the epiphysal cartilage was bony in architecture and its density indistinguishable from the epiphysis and diaphysis in its neighbourhood but an epiphysal line called epiphysal scar could still be distinguished (3/4 united)

**Stage 5 (F5):** Complete union – with absence of epiphysal scar.

**Fusion of Distal end of Tibia in Females:** It is clear from **Table 2** that in Female subjects in between age group 3 to 11 years cases were seen in F1, F2 and F3 stage of fusion. In between 11-12 years age group 50% cases were in F3 stage of fusion. In between 12-13 years age group 33.3% cases were in F3 stage of fusion. In majority of cases in age group 13-14(75%) and 14-15 (25%) show near fusion (F4), where as in age groups 14-15(7.9%), 15-16(10.5%) and onwards majority of cases showed complete fusion (F5).

## DISCUSSION

It is clear from the results that in this study distal end of Tibia, the complete union of epiphysis is seen by 16-18 years in males and 14-16 years in females. Finding of fusion of Distal end of

**Table 2** Incidence and extent of fusion Distal end of Tibia in different age groups in females

Extent of appearance & fusion	3-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-23	Total
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
F1	10 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10 (100)
F2	10 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10 (100)
F3	1 (16.7)	3 (50.0)	2 (33.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (100)
F4	0 (0)	0 (0)	0 (0)	3 (75.0)	1 (25.0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6 (100)
F5	0 (0)	0 (0)	0 (0)	0 (0)	3 (7.9)	4 (10.5)	5 (13.2)	4 (10.5)	6 (15.8)	3 (7.9)	13 (34.2)	38 (100)



**Table 3** Comparison of time of fusion of Distal end of Tibia in years

Author	Year	Race	Sex		
			Males (Yrs)	Females(Yrs)	Mixed (Yrs)
Galstaun	1937	Bengalis (Indians)	16	14-14.4	-----
Pillai	1936	Madras	-----	-----	14 - 17
Flecker	1932	Australia	17	14	-----
Davies & parson	1927	English	-----	-----	17 -18
Hepworth	1929	Panjab	-----	-----	16.5 -17.5
Parikh	1990	Indian	-----	-----	16-18
Basu&basu bengali females	1957	Bengali hindu females	-----	14	-----
Present study	2010	Mumbai (indian)	16-18	14-16	-----

Tibia in present study correlates with Gaulstaun study in Bengalis,<sup>4</sup> Pillai study in Madras,<sup>1</sup> Fleckers study in Australians,<sup>5</sup> Hepworth's study<sup>6</sup> in Punjabis in males and Basu and Basu's<sup>7</sup> study in Bengali Hindu females. The only documented study done previously in Mumbai region was by Homi S Mehta<sup>8</sup> in Mumbai region, which does not include this center. As compare to Devis and Parsan study<sup>1</sup> in Australians and Hepworth study<sup>6</sup> in Punjabis fusion occur one year earlier in females.

The variation in time of fusion of different bones of lower limb has been established long back. Countable differences are noticed in the appearance and fusion activities of ossification centers depending on race geographic distribution and sex. The process of ossification may also be influenced by food habit, nutritional status, infectious disease, hormonal and metabolic disorders and physical activity. The long bones of lower limb play a vital role in assessment of age both in living and dry remains. Currently there is an obvious lack of standards for epiphyseal union for the purposes of assignment of chronological age.

While most researchers determine union visually, some scholars advocate the use of radiographs to determine the degree of union. While selecting the patients following criteria are to be kept in consideration.

- They are born to parents living in that particular region and subject is living in the same region since birth.
- They have authentic documentation of their date of birth.
- The subjects should not have any bony deformity or pathology and should not have any known chronic disease affecting the general health of person.
- Subjects from all strata of society are included.

Similar care should be taken regarding centering of the X-ray tube over the epiphyses as it is quite easy to give an un-united epiphysis the appearance of union by directing the cone of X ray obliquely. The observations thus made by different authors for lower end of tibia are shown in Table III.

In this study distal end of Tibia, the complete union of epiphysis is seen by 16-18 years in males and 14-16 years in females. The present study signifies that all centres in females mature 1-2 years earlier than in Males. This observations correlates with

the previous studies done. Comparison of observations of present study has been made with other studies in table-3 with reference to age of fusion in both sexes.

## CONCLUSION

Such type of work has been carried out by different researchers from time to time. Most of them have shown regional as well as sexual variations in time of occurrence of epiphysis of bones of lower limb. Apart from consideration of centers of ossification by Dr. Homi S Mehta for population of Mumbai region additional center of ossification have been studied in this study which will be helpful to arrive at correct diagnosis with closer range. Distal end of Tibia, the complete union of epiphysis is seen by 16-18 years in males (16%) and 14-16 years in females (18.4%). The present study findings are close to Galstaun, Pillai, Flecker, Hepworth, Basu and Basu and Parikh.

As this study is done in Mumbai region the application of standards can be considered ideal for application in Mumbai region. Due to very narrow borderline range of differentiation between various stages of fusion (i.e. Stage 1 to Stage 5), it is difficult to consider stage of fusion as age indicator.

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## ORIGINAL PAPER

# A study on the importance of thumb print in human identification

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### ABSTRACT

**Introduction:** Human identification by the use of finger prints is infallible, because the ridge arrangement on every finger of every human being is unique and does not alter with growth or age. The present study has been conducted with an aim to determine the most common thumb print pattern in both males and females and whether there is any relation between them.

**Methods:** The study has been conducted in the Department of Anatomy, Gauhati Medical College, Guwahati, amongst a group of 145 1<sup>st</sup> MBBS students (89 males and 56 females), having different ethnic backgrounds after approval of the Institutional Ethical Committee. Participants were briefed about the purpose of the study and written informed consent was also taken from them. The thumb print of the dominant hand was taken using printer's blue ink and was transferred on to a white bond A4 paper. The prints thus recorded were studied with a magnifying lens and were classified on the basis of Michael Kucken's classification system as Loop, Arch, Whorl and Composite pattern. **Results:** The present study revealed that there is no significant difference between male and female as far as the distribution of the different types of thumb print is concerned. Also, it is seen that the 'loop' and 'whorl' variety is much higher than the 'arch' and 'composite' variety of print which is more evident in case of males. **Discussion:** The finding of our study has the similarity with the observations made by other researchers in this field. **Conclusion:** Such a study may be useful in establishing a database which may be useful in various medicolegal cases to identify an individual.

**Keywords:** Fingerprints, Thumb-prints, Identification, Dermatoglyphics

### INTRODUCTION

Fingerprints are considered to be the most reliable criteria for personal identification.<sup>1</sup> These are the reproductions of the patterns formed by the papillary ridges present on the palmar aspects of the thumbs and fingers. They afford an infallible means

of personal identification, because the ridge arrangement on every finger of every human being is unique and does not alter with growth or age.<sup>2,3</sup> The fingerprint patterns become fixed when a person is about 14 years or older.<sup>4</sup> No two fingers are found to have identical prints even in identical twins, who share the same DNA profile.<sup>5</sup> The use of fingerprint recognition has expanded to personal authentication and government-to-citizen applications as well.<sup>6</sup> The study of finger prints is also known as Dermatoglyphics.<sup>7,8,9</sup> In the present study we have aimed at determining the most common finger print pattern in both sexes.

### METHODS

**Materials:** Printer's blue ink, White bond paper (Royal Executive Bond, Premium White A 4 sheets), Magnifying glass (10X), Pen for labelling individual details.

**Method:** The study was conducted in the Department of Anatomy, Gauhati Medical College, Guwahati, amongst a group of 145 1<sup>st</sup> MBBS students (89 males and 56 females), having different ethnic backgrounds. Necessary approval was taken from the Institutional Ethical Committee. All the participants were briefed about the purpose of the study and written informed consent was also taken from them. Care was taken to select individuals having no lesions, whether active or passive on the fingers.

**Collection and analysis of print:** For obtaining the prints, the thumb of the dominant hand of the subjects was considered. The imprint obtained from the thumb using printer's blue ink was transferred on to a white bond A 4 paper. The prints thus recorded were studied with a magnifying lens. The thumbprint patterns

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were classified on the basis of Michael Kucken’s classification system as Loop, Arch, Whorl and Composite pattern.

Results

Table 1 Total number of male and female cases

Different type of thumb print in male & female		
Type of thumb print	Number of cases	
	Male	Female
Loop	40	31
Whorl	29	12
Arch	14	6
Composite	6	7
SUM	89	56
Mean	22.250	14.000
SD	±15.196	±11.633
SEM	±7.598	±5.816

In the present study it is seen that the number of male cases in various type of thumb prints ranges from 6 to 40 with a mean value of 22.250, Standard Deviation ± 15.196 and Standard Error of Mean ± 7.598 and the number of female cases in various type of thumb prints ranges from 6 to 31 with a mean value of 14.000, Standard Deviation ± 11.633 and Standard Error of Mean ± 5.816 as evident in Table 1 and Figure 1.

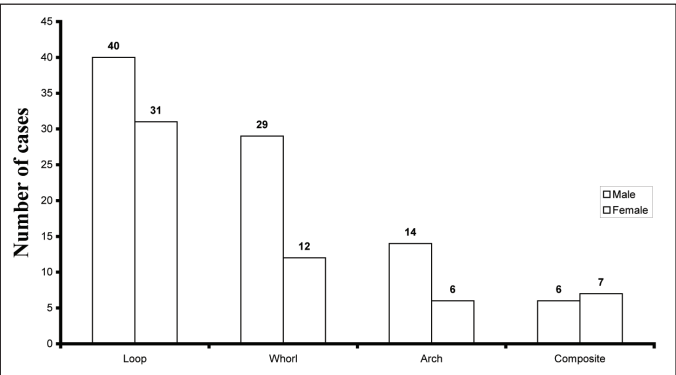


Figure 1 Number of cases in different type of thumb print

In male for arch and composite type of thumb print we get the mean value of 10.000, Standard Deviation ± 5.657 and Standard Error of Mean ± 4.000 and in female cases for loop arch and

Table 2 Total number of male and female cases in loop & whorl type of finger print

Loop and whorl type of thumb print in male & female		
Type of thumb print	Number of cases	
	Male	Female
Loop	40	31
Whorl	29	12
SUM	69	43
Mean	34.500	21.500
SD	±7.778	±13.435
SEM	±5.499	±9.499

In male for loop and whorl type of thumb print we get the mean value of 34.500, Standard Deviation ±7.778 and Standard Error of Mean ±5.499 and in female cases for loop and whorl type of thumb print we get the mean value of 21.500, Standard Deviation ±13.435 and Standard Error of Mean ±9.499 as evident in Table 2 and Figure 1.

Table 3 Total number of male and female cases in arch & composite type of finger print

Arch and composite type of thumb print in male & female		
Type of thumb print	Number of cases	
	Male	Female
Arch	14	6
Composite	6	7
SUM	20	13
Mean	10.000	6.500
SD	±5.657	±0.707
SEM	±4.000	±0.499

composite type of thumb print we get the mean value of 6.500, Standard Deviation ± 0.707 and Standard Error of Mean ± 0.499 as evident in Table 3 and Figure 1.

Table 4 Distribution of frequency, relative frequency & percentage of frequency

Class interval of different type of thumb print	Thumb print in male & female					
	Male			Female		
	f (frequency)	fr (relative frequency)	f% (percentage)	f (frequency)	fr (relative frequency)	f% (percentage)
Loop	40	0.449	44.900	31	0.553	55.300
Whorl	29	0.325	32.500	12	0.214	21.400
Arch	14	0.158	15.800	6	0.108	10.800
Composite	6	0.068	6.800	7	0.125	12.500
Sum	89	1.000	100.000	56	1.000	100.000



Table 4 shows that for the male group highest number of subjects is found in the class interval of 'Loop' type of thumb print with a relative frequency of 0.449, simple frequency of 40 and a percentage of 41.900. The lowest number of subjects is found in the class interval of 'Composite' type of thumb print with a relative frequency of 0.068, simple frequency of 6 and a percentage of 6.800 as evident in **Figure 2 & 3**.

For the female group highest number of subjects is found in the class interval of 'Loop' type of thumb print with a relative frequency of 0.553, simple frequency of 31 and a percentage of 55.300. The lowest number of subjects is found in the class interval of 'Arch' type of thumb print with a relative frequency of 0.108, simple frequency of 6 and a percentage of 10.800 as evident in **Figure 2 & 3**.

Frequency distribution of different type of Thumb prints in male & female

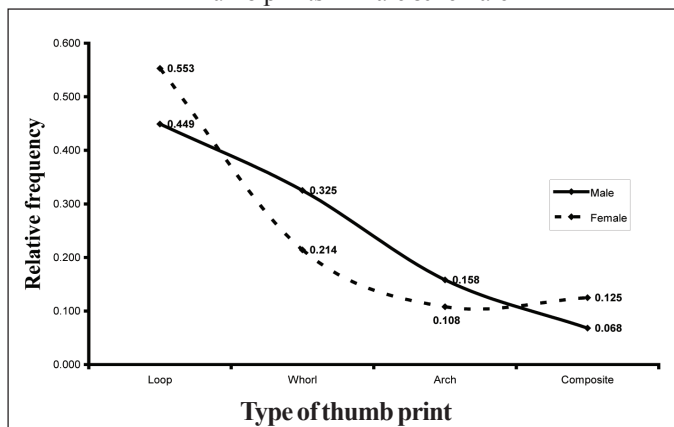


Figure 2 Relative frequency

## DISCUSSION

Establishing the identity of an individual is necessary for many reasons such as personal, social, and legal, including certification of death.<sup>8</sup> Finger prints are constant and individualistic and form the most reliable criteria for identification.<sup>9, 10</sup> A lots of studies have been conducted till date on fingerprinting. However, no such documented study regarding fingerprinting in the establishment of the sex of an individual is available from North-eastern India. The present study aims at throwing some light in

this aspect. The present study revealed that in males highest to lowest number of incidences of different variety of thumb prints are respectively loop, whorl, arch and composite. In females highest to lowest number of incidences of different variety of thumb prints are respectively loop, whorl, composite & arch. If we compare all the four variety of thumb prints of both male and female together though there is difference in number of cases in each variety, it is without any significance ( $P > 0.05$ ). There is strong co-relation between male and female if all varieties are compared together ( $R = 0.882$ ). Again, in males if 'loop' & 'whorl'

Distribution of percentage of frequency of different type of thumb prints in male & female

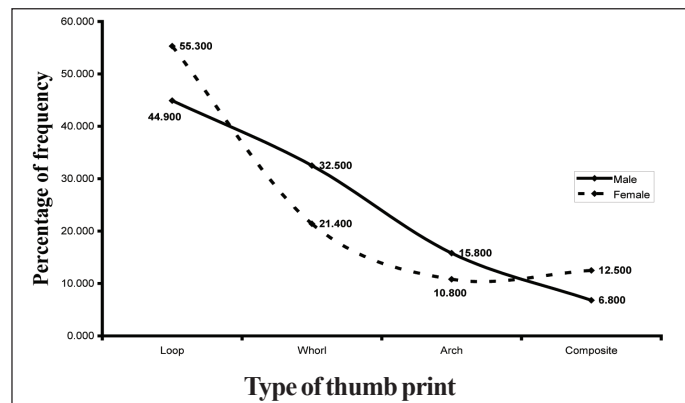


Figure 3 Percentage of frequency

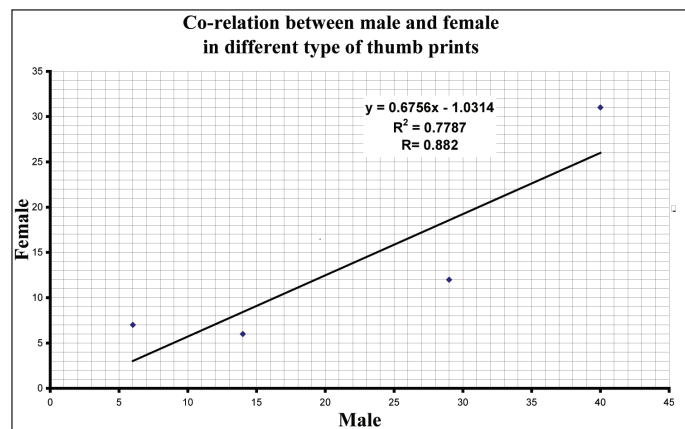


Figure 4 XY (Scatter) chart with trend line and R-Value

Table 5 Level of significance of differences between the various categories

Serial number	Comparison of mean between	"t"	P
1	Different type of thumb prints in male and different type of thumb prints in female	0.862	> 0.05
2	'Loop & whorl' type of thumb print in male and 'arch & composite' type of thumb print in male	3.603	< 0.05
3	'Loop & whorl' type of thumb print in female and 'arch & composite' type of thumb print in female	1.576	> 0.05

together is compared with ‘arch’ & ‘composite’ the incidence of the first two varieties is much higher than the last two varieties with significance ( $P < 0.05$ ). Like wise in case of females though the first two varieties are much higher than the last two varieties, but it is without any significance ( $P > 0.05$ ).

### CONCLUSION

Establishing the identity of an individual is necessary for many reasons such as personal, social, and legal, including certification of death.<sup>10</sup> Finger prints are constant and individualistic and form the most reliable criteria for identification.<sup>11,12</sup> From the above study, we can conclude that in different type of thumb print there is no significant difference between male & female; and the ‘loop’ and ‘whorl’ variety is much higher than the ‘arch’ and ‘composite’ variety of print which is more evident in case of male under the limitations of the present set of studies.

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## ORIGINAL PAPER

# Correlation between atherosclerotic plaques in aorta and morbid pathology of heart

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## ABSTRACT

**Introduction:** Coronary heart disease is now the major killer of humans all over the world. Many studies have shown positive correlation between atherosclerosis of aorta and coronary artery disease. **Objectives:** Coronary heart disease is now the major killer of humans all over the world. Many studies have shown positive correlation between atherosclerosis of aorta and coronary artery disease. This study tries to analyse correlation between presence of atherosclerotic plaques in aorta and morbid pathology of heart. **Methods:** It is a Descriptive, Observational, Cross sectional study, carried out on 406 cases from the autopsies done in RG Kar Medical College Police Morgue selected by Purposive Random Sampling from 1st April, 2014 to 31st March, 2015. All autopsy cases were included except grossly mutilated or decomposed bodies. **Result:** Out of 406 cases, 156(38%) cases showed atherosclerotic plaques in aorta. Weight of heart was significantly more in cases with atheromatous plaques in aorta. Cases with grade II or III atheromatous plaques in aorta showed higher weight of heart and thicker left ventricular wall. **Conclusions:** Presence of atherosclerotic plaques in aorta shows positive correlation with increased heart weight and thicker left ventricular wall. However more thorough multidisciplinary research is needed for better understanding of the role atherosclerosis plays in coronary heart disease.

**Keywords:** Aorta, Atheroma, atherosclerotic plaques, coronary artery disease, heart, left ventricular wall thickness

## INTRODUCTION

The 20<sup>th</sup> century witnessed profound, unprecedented changes in the natural, man-made, and social environments-dramatic changes in the patterns and distribution of human disease were inevitable. Gone are the days of black plague, now we are living in a time when obesity, hypertension, diabetes have reached pandemic proportions.<sup>1</sup>

There is considerable increase in prevalence of coronary heart

disease in urban areas of India since last decade. In the majority of cases, atherosclerosis is the single most important pathological mechanism responsible for coronary heart disease.<sup>2</sup>

Arteriosclerosis is a generic, inclusive term that describes thickening and hardening of arterial wall. Atherosclerosis is a type of arteriosclerosis. The name comes from the Greek words athero (meaning gruel or paste) and sclerosis (hardness).<sup>3</sup> Atherosclerosis is a complex multifactorial inflammatory process, characterized by intimal lesions called atheromatous plaques. Epidemiology has identified acute thrombus anchored on ruptured atheromatous plaques in 70% to 80% of cardiovascular deaths.<sup>4</sup>

**Objectives:** To note the gross morphology of the heart in autopsy cases with atherosclerotic plaques in aorta and to find out its association with presence of plaques, if any.

## METHODS

**Study setting:** After getting clearance from the Ethics Committee, the present work has been conducted in the RG Kar Medical College & Hospital Police Morgue from 1st April, 2014 to 31st March, 2015.

**Definition of study population:** The study has been carried on all dead bodies brought to RG Kar Medical College & Hospital Police Morgue for medico-legal autopsy.

**Inclusion/exclusion criteria:** All autopsy cases were included

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except grossly mutilated or decomposed bodies.

**Sample size:** The study has been carried out on total of 406 cases from the autopsies done in RG Kar Medical College Police Morgue selected by Purposive Random Sampling.

**Study design:** It is a Descriptive, Observational, Cross sectional study.

**Consent:** As the study included the cases on medico-legal autopsy, so, consent is not required.

RESULT

Out of 406 cases, atherosclerotic plaques in aorta were found in 156 cases. **Table I** shows distribution of cases with highest grade of atheromatous plaques in aorta with mean weight of heart. In cases with grade II or III plaques in aorta, mean weight of heart increases. Correlation analysis gives Pearson’s  $r = 0.526$ , i.e. a positive correlation exists between the two variables; P value  $<.01$ , i.e. this correlation is statistically significant.

Table 1 Highest grade of atheromatous plaques in aorta with mean weight of heart

Highest Grade of Atheromatous Plaque	Mean Weight of Heart
Grade I	287.89
Grade II	290.47
Grade III	297.52

**Table 2 shows** Distribution of cases according to highest grade of atheromatous plaques and left ventricular wall thickness. Cases with atheromatous plaques of higher grade have thicker left ventricular wall than others. Correlation analysis gives Pearson’s  $r=+0.326$ ; i.e. there exists a positive correlation between grade of atheromatous plaques in aorta with left ventricular wall thickness- with presence of higher grade of atheromatous plaque in aorta, thickness of left ventricular wall increases. P (2-tailed signify) :  $<0.001$  i.e. the correlation is statistically significant.

Table 2 cases according to LV wall thickness

Grade of Atheromatous Plaques	LV wall thickness			
	<15 mm	15-20 mm	>20mm	>20mm
Grade I	18	17	1	36
Grade II	14	58	13	85
Grade III	3	19	13	35

Out of these 156 cases with Atheromatous plaques in aorta, 24(15%) died of natural causes as found during autopsy. **Table 3** shows frequency distribution of cases with atherosclerotic plaques in aorta who died of natural causes according to weight of heart (n=24). Out of 24 cases with atherosclerotic plaques that died of natural causes, 16(67%) cases had hearts weighing more than 300 grams.

Table 3 cases who died of natural causes according to weight of heart (n=24)

Heart weight	No. of cases
<250	1
250-299	7
300-349	9
350-400	5
>400	2
Total	24

**Table 4** shows frequency distribution of cases with atherosclerotic plaques in aorta who died of natural causes according to left ventricular wall thickness (n=24). Out of 24 cases with atherosclerotic plaques in aorta that died of natural causes, in 17 of them left ventricular wall was thicker than 15 mm, including 4 cases where left ventricular wall thickness was more than 20 mm.

Table 4 cases who died of natural causes according to left ventricular wall thickness (n=24)

Left Ventricular Wall Thickness	No. of cases
<15mm	7
15-19mm	11
20-24mm	4
<25mm	2
Total	24

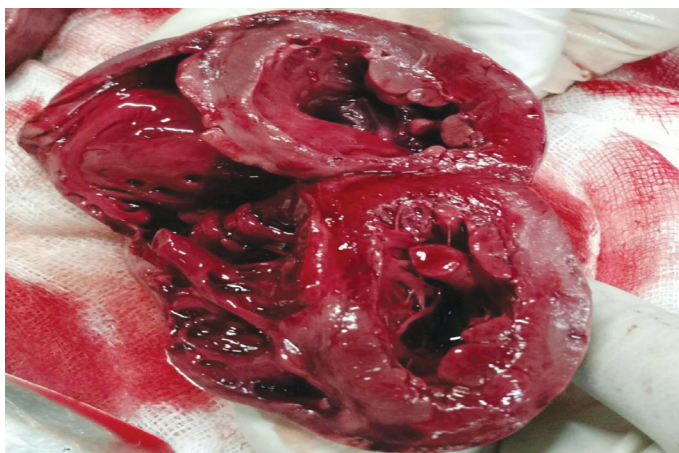
**Table 5** showing incidence of atheroma at coronary ostia in cases with atherosclerotic plaques in aorta who died of natural causes according to atheromatous stenosis of coronary ostium (n=24). Out of 24 cases with atherosclerotic plaques in aorta that died of natural causes, 15 cases had atheroma at coronary ostia.

Table 5 Incidence of atheroma at coronary ostia (n=24)

Atheromatous stenosis of Coronary Ostium	No. of cases
Present	15
Absent	9



Photo 1 Original Coloured photograph showing multiple grade II atheroma’s in ascending aorta



**Photo 2** Original Coloured photograph of heart cut along short axis showing thick left ventricular wall

## DISCUSSION

In today's modern world, chronic non-communicable diseases or 'life style diseases' have emerged to be responsible for maximum no. of deaths.<sup>5</sup> Atherosclerosis plays a major role in the pathogenesis of ischemic heart disease and stroke.<sup>6</sup> This study was done on 406 cases among the medicolegal autopsies done at R.G. Kar Medical College & Hospital Police Morgue from 1<sup>st</sup> April, 2014 to 31<sup>st</sup> March, 2015. On dissection and examination of aorta, in 156(38%) cases atherosclerotic plaques were seen.

Weight of heart was significantly more in cases with grade II or III plaques or with plaques of all 3 grades in aorta. Similar trend was also seen in case of left ventricular wall thickness of heart-cases with plaques of higher grade had thicker left ventricular wall. Out of 156 cases with atheromatous plaques in aorta, 24(15%) cases died of natural causes. Among these 24 cases with atheromatous plaques in aorta who died of natural causes, weight of heart was more than 300 gms in 16 cases and left ventricular wall thickness was more than 15 mm in 17 cases. 15 of these cases had atheromatous stenosis of coronary ostium. In 5 cases heart showed macroscopic scar secondary to infarction, in 4 cases valves were calcified and in 9 cases coronary arteries were thickened and stenosed. Though the incidence of morbid gross pathological features of heart was found to be more in subjects with atherosclerotic plaques in aorta under this study, conclusions about their correlation cannot be drawn without doing individual corrections for other risk factors of atherosclerosis. This requires a multi-disciplinary approach which was out of scope of this study.

*Kallikazaros Ioannis E.* et al studied extent of atherosclerosis in aorta and found that among Sixty-two consecutive cardiac patients (mean age 57 years) without a history of atherosclerotic cardiovascular disease 35 patients (56.5%) had atherosclerotic plaques.<sup>7</sup>

*Michiel A. de Graff* et al published an article elaborating the association of atherosclerotic plaques in thoracic aorta with coronary artery disease in 2013 where they have showed that 81% of cases with CAD showed atherosclerotic plaques in thoracic aorta. They also showed significant correlation between

prevalence of atherosclerotic plaques in aorta and increased left ventricular wall thickness of heart.<sup>8</sup>

*Bashe WJ Jr and Baba N, Keller et al* studied Pathology of atherosclerotic heart disease in sudden death in 1975 in 121 cases of sudden death and the authors concluded with statistically significant histological evidences that sudden cardiac deaths are results of functional instability of the myocardium produced by advanced coronary atherosclerosis.<sup>9</sup>

*Meissner Irene et al* in 2004 found that during five-year median follow-up of a random sample of 585 persons, cardiac events had occurred in 95 subjects. Complex plaques were found to be associated with cardiac event only after adjusting for other clinical risk factors.<sup>10</sup>

*Agmon Yoram et al* studied relation of coronary artery disease with atherosclerosis of the thoracic aorta in the general population in 2002. They found that Coronary artery disease was found to be strongly associated with complex aortic atherosclerosis in the general population.<sup>11</sup>

Hence, findings of this study corroborates with similar studies done around the world regarding positive association between atherosclerosis and morbid changes in heart. However, it is also a proven fact that with lifestyle modification like dietary changes, light aerobic exercises, cessation of smoking or with better control of blood sugar and hypertension, atherosclerosis progression not only can be stopped, but can be reversed also.<sup>12</sup> Studies done using modern technologies like Trans-Oesophageal Echocardiography<sup>13</sup> or 18-FDG PET among cases and controls selected on the basis of various risk factors, have yield valuable inputs regarding factors contributing to progression of atherosclerosis.

## CONCLUSION

Many studies done around the world has proved that inception of atherosclerosis may be seen in childhood, even in infancy. If sufficient support becomes available from public and private fronts, on the basis of the findings from these studies, mass awareness programmes need to be adopted by governments and as well as by NGOs to educate people about the benefit of lifestyle modification and early medical intervention in reducing morbidity and mortality from Atherosclerotic Cardio-vascular Diseases and ischemic strokes.

**Conflict of interest:** No conflict of interest associated with this work.

**Contribution of authors:** We declare that this work was done by the author(s) named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. We declare that We contributed significantly towards the research study i.e., (a) conception, design and/or analysis and interpretation of data and to (b) drafting the article or revising it critically for important intellectual content and on (c) final approval of the version to be published.

**Ethical clearance:** Ethical clearance was obtained.

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## ORIGINAL PAPER

# Study on incidence of POCSO cases in Mumbai region

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### ABSTRACT

**Introduction:** Sexual assault is an assault of a sexual nature on another person without consent. The parliament of India passed the "Protection of children against sexual offences Act, 2012 which provides protection for a variety of offences. **Aims:** To find out the incidence of Pocso cases with respect to age, sex and relation of victim with assailant in Mumbai region. **Methods:** The study will be conducted retrospectively on Pocso cases referred to Sir JJ hospital in between January 2015 to January 2017 after taking permission from concerned departments. In our present study, we have taken 200 cases for study purpose. **Results:** Out of 200 cases, 180 cases were of female while 20 cases were of male showing female preponderance. Majority of victims in sexual assault cases were victimized by persons they knew (67%) and few by Strangers (33%). A minimum age of male and female victim was 03 yrs and 02 yrs respectively while maximum age of male and female victim was 13 years and 18 years respectively. **Conclusion:** From our present study it can be concluded that crime against children is increasing since last 2 yrs, female child are more affected than male. Most of the assailants are persons in position of trust. In order to decrease sexual assault crime against children there is need of awareness among common people and parents regarding child protection, approach to police without any fear, training sessions for children and teachers regarding bad touch and good touch.

**Keywords:** Sexual assault, Age, Relative, Children

### INTRODUCTION

Child sexual abuse includes a variety of sexual offences like sexual assault, sexual molestation, sexual exploitation and sexual grooming. Sexual assault is an assault of a sexual nature on another person or any sexual act committed without consent.<sup>1</sup> Sexual molestations an offence in which an adult engages with minor in non-penetrative activity for the purpose of sexual gratification. The effects of child sexual abuse include depression, posttraumatic stress disorder, anxiety and physical injury to the child. No question of minimum age of girl arises as

peras rape is concerned because victim of rape have ranged from infants to old and infirm. The first state in India to frame a law in order to deal with offences against children including child trafficking was Goa. The Goa children's Act 2003 was framed following infamous Freddy peatscase.<sup>2</sup>

In 2007 the Ministry of woman and child development published the article "study on child abuse: India 2007." It took into consideration different forms of child abuse. The main highlights of study were that 53% of children faced sexual abuses, among them 53% were boys and 47% were girls. 22% of child respondents faced severe forms of sexual abuse, 6% sexually assaulted and 51% other forms of sexual abuse. The study also reported that 50% of abusers were known to the child or are in a position of trust and responsibility and most children had not reported matter to anyone.<sup>3</sup>

The parliament of India passed the Protection of children against sexual offences Act, 2012 regarding child sexual abuse on May 2012. It provides for a variety of offences under which an accused can be punished. It recognizes forms of penetration other than peno-vaginal penetration. It criminalizes acts of immodesty against children, it criminalizes even watching or collection of pornographic content involving children. The main criticism of this act is that it has criminalized consensual intercourse between two people below the age of 18 yrs while previously it was 16 yrs.<sup>4</sup>

### METHODS

The study will be conducted retrospectively on Pocso cases referred to **Sir JJ Hospital** in between January 2015 to January 2017 after taking permission from concerned departments. All the relevant information such as details of victim, age, sex, relation

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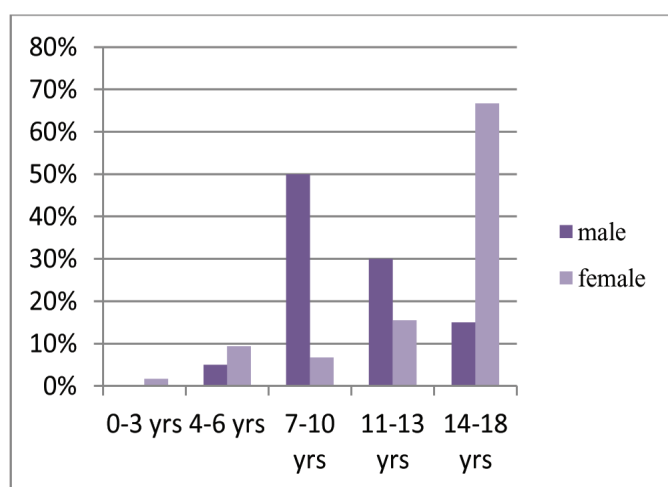
of victim with the accused etc. was gathered from police requisition letter and sexual assault examination forms filled by on duty doctors of Forensic medicine and gynecology department. An attempt has been made to find out the incidence of Pocsos cases with respect to age, sex and relation of victim with assailant in Mumbai region.

### AIMS

- 1) To study the incidence of Pocsos cases with respect to age.
- 2) To study the incidence of Pocsos cases with respect to sex.
- 3) To study relation of victim with accused.

### RESULTS

There are various types of medicolegal cases which are referred to Sir JJ hospital from different parts of Mumbai region as this hospital is a tertiary referral centre. The variety of Cases includes sexual assault cases, Rape cases, sodomy cases, potency cases, injury cases, Narcotic cases etc. All the above cases are examined either in casualty or in gynecology ward by team of doctors on taking informed written consent of patients. In case of minor consent of guardian is taken. In the last 2 years i.e., in between January 2015 to December 2017 total 204 pocsos cases have been examined by concerned on duty doctors. In our present study, we have taken 200 cases out of which 180 cases were of female while 20 cases were of male showing female preponderance. Majority of victims in sexual assault cases were victimized by persons they knew (67%). It shows that children are most at risk from their relative's friends and relatives and few by strangers (33%).<sup>5</sup> Minimum age of male victim was 03 years & maximum age was 13 years. Minimum age of female victim was 02 years & maximum age was 18 years. Severest sexual abuses were in age group of 6-12 years. It has been observed that maximum age group affected was 14 -18 years (**Figure 1**). Known assailants include father, relative, boyfriend, friend, neighborhood. Most common injuries noted were scratch abrasions, contusion.



**Figure 1** Age wise distribution of pocsos cases in Male and Female

### DISCUSSION

This paper summarizes the findings of our study which shows that girl sexual abuse occurs more commonly. Our finding positively correlates with the findings of study done by U.K.

Kulkarni of forensic science laboratory, kalina and findings of study done by Sarkar S C in south delhi however it doesn't corresponds to study done in 2007 by Ministry of women and child development and study done by Krishna Kumar of keralastate.<sup>3,5,6,7</sup> Mr. UK Kulkarni carried out study at directorate of forensic science laboratories, biology division, Mumbai, Maharashtra. A total of 100 cases of child sexual assault were taken into consideration for study purpose in which he found female sexual abuse occurs more commonly compared to male sexual abuse.<sup>5</sup> In 2007 government of India published its report as "Study on child abuse: India 2007" in which they found that 52.94% male suffered sexual abuse while 47% female suffered sexual abuse which doesn't correspond to our study.<sup>3</sup> A study was conducted by Krishna Kumar in kerala state where he also had similar results as that of study carried out by government of India however his study was limited to adolescent group.<sup>7</sup> Our study on adolescent group doesn't correspond to above study.

As per as age is concerned, Minimum age of Male victim was 03 yrs and Maximum age was 13 years. Minimum age of female victim was 02 years and maximum age was 18 years. It has been observed that in female maximum age group affected was of 14 -18 years while in Male it was 7-10 years. Upto 10 years of age maximum age group affected in female was 4-6 years. The second most affected age group both in male and female is 11-13 years. Figure 2 "Study on child abuse: India 2007" concluded that 73% of sexual victims were in age group of 11-18 years which positively corroborates with our study if female are taken into consideration.<sup>3</sup> A study carried out by Mr UK Kulkarni of forensic science laboratories, biology division Mumbai, Maharashtra reveals that minimum age of female victim was 2 years and that of male was 3 years as seen in our study. It also reveals that maximum age group affected in female was 11-14 years while in our study it was 14-18 years where as in male maximum age group affected was 11-14 years while in our study it was 7-10 years.<sup>5</sup> Mr kumar pal carried study on 35 sexual assault cases at forensic science laboratory, Dharmashala, Himachal Pradesh where he found that highly affected age group was 11-20 years thus positively correlating to our study.<sup>8</sup> Another study was done by Dr SC Sarkar on 90 victims of sexual offences at AIIMS, New Delhi shows that maximum age group affected in female was 16-20 years and male was 6-10 years thus positively correlating with findings of our study with respect to maximum age group affected in female and male.<sup>6</sup> Dr UB Roy Chowdhary carried out retrospective study on 80 cases at Medical college, Kolkata. He found that maximum age group affected was 16-20 years followed by 11-15 years thus corroborating with our study.<sup>9</sup> Elaan an NGO did study on child abuse in Kolkata and found that maximum age group affected among boys is 9-12 years correlating to our study to some extent.<sup>10</sup>

Out of the total cases, 67% of sexual assault cases were perpetrated by persons known to victim and 33% of sexual assault cases were perpetrated by unknown persons i.e, strangers. Known assailants include father, relative, boyfriend, ex-boyfriend, neighbor. In females out of 180 sexual assault cases 120 cases were perpetrated by persons known to victim i.e, 67% of sexual assault cases and 80 cases were perpetrated by strangers while

in male 14 sexual assault cases were perpetrated by persons known to victim and 7 sexual assault cases were perpetrated by strangers. Among known assailants most common perpetrator were persons who were in positions of trust followed by boyfriends followed by friends. Our study corroborates with study of Dr SC Sarkar. According to him the persons who are in acquaintance with children are most common culprits (44%) followed by neighbor and strangers.<sup>6</sup> Dr UB Roy also have same opinion as that of Dr SC Sarkar, however his retrospective study was limited to 80 cases in which he found that in 80% of cases offenders was known to victim.<sup>9</sup> Also Ministry of women and child development 2007 study found that 50% of fenders were known to victim or were in position of trust like family member or close relative or friend.<sup>3</sup> Kumar Pal who carried out study in Northen part of Himachal Pradesh was also of same opinion. He stated that 80% of victims knew assailant. Among the known assailant 71% were close friends and relative.<sup>8</sup> Mr UK Kulkarni in his study found that 68% of sexual assault cases were perpetrated by known assailant and 22% were perpetrated by strangers. He stated that most common assailant were persons in a position of trust followed by friends, boyfriends and neighbor.<sup>5</sup> Our findings positively correlate with all above studies.

In children less than 10 years, none of them had hymenal tear. As we know that vagina is very small and hymen is deeply situated in children adult penis cannot penetrate it. If done forcibly with great force than there are chances of vaginal tear and occasional tear of hymen, however in almost all cases hymen is usually found intact.<sup>11</sup> In children hymenal tear doesn't occur in spite of sexual intercourse due to its high up position in vagina.<sup>12</sup> Our finding positively correlates with it.

In our present study, we encountered 4 female cases who were subjected to pornography along with sexual assault by an assailant. The provisions of Protection of children against sexual offences Act, 2012 provides punishment of 6-8 years with fine incase child is used for pornographic purpose which is covered under sec. 14 sub section (2) of PocsO act.<sup>4</sup>

In our present study, 07 penetrative sexual assault cases of female had history of intoxication by assailant. As per sec 375 IPC clause fifth states that "if a man has a sexual intercourse with girl with her consent however at the time of giving consent by reason of unsoundness of mind or intoxication by him personally or through another of ant stupefying substance she is unable to understand nature and consequences of that to which she gives consent".<sup>13</sup>

In our study there were 3 female cases of penetrative sexual assault and 1 male case of penetrative sexual assault that were forced by assailant to have an anal intercourse with them. Two female cases had abrasion and bruises over anal region. Such abrasions are produced due to frictional sharing of penetrating penis or as a result of fingernail scratching.<sup>13</sup> Also 5 male cases and 1 female case had history of oral sex called as buccal coitus. It is defined as sexual gratification of male by performing the act of intercourse into the oral cavity of a sex partner with consent or by force. It is usually practiced with innocent child victim. Death of child victim may occur in such cases due to mechanical

asphyxia as a result of accidental respiratory tract obstruction by the ejaculating bouts of semen.<sup>12</sup> All such unnatural sexual offences are punishable by law under sec 377 IPC.<sup>13</sup>

In our present study 06 female had pregnancy following penetrative sexual assault. Duration of pregnancy of in all of them was between 4 weeks to 14 weeks. All of them opted for abortion under the regulation of Medical termination of pregnancy Act 1971. As per the act pregnancy can be terminated if such pregnancy has occurred due to rape on the humanitarian ground. A girl aged between 16-18 years can have consensual sexual intercourse but if she becomes pregnant she cannot terminate pregnancy. In such cases consent of parent or guardian is necessary.<sup>14</sup>

One of female victim had bite mark around her right nipple region. Most of the bite marks are seen in cases of sexual of fences or in child abuse. A bite mark usually consists of two opposite semicircles which may be incomplete. The mark is an abrasion or contusion or both. There may be confluent petechie in centre caused by suction called as love bite most commonly seen in sexual assault cases. In our case there was no such finding.<sup>15</sup>

## CONCLUSION

From our present study it can be concluded that female child are more affected than male, most of the assailants are persons in position of trust, Minimum age of male victim was 03 years while that of female was 02 years & maximum age was 13 years in male and 18 years in females. It has been observed that maximum age group affected in female was 14-18 years.

Most of the cases of child sexual assault are not reported due to fear, innocence of child and feeling of guilt by parents. In order to decrease crime against children it is duty of each and every one concern to take necessary preventive measures which will ensure safety of child.<sup>16</sup> There is need of awareness among common people and parents regarding child protection, approach to police without any fear. It is important to have training sessions for children and teachers regarding bad touch and good touch, avoid going out with strangers, if any suspicion children should report to teachers or parents. If any child had sexual assault then it is duty of parents or relatives to take them to hospital for medical examination and inform to police regarding same. Also mental health program needs to be involved in follow up cases of victim with regards to psychiatric disorders, rehabilitation and individual counseling.

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**Author's contribution:** We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Dr. Sunny khandare and Dr. SD. Nanandkar conceived, designed the study as well as collected data an analyzed the same.



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## ORIGINAL PAPER

# Detection of pulmonary tuberculosis using cartridge based nucleic acid amplification test (CBNAAT) and fluorescent microscopy

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## ABSTRACT

**Background:** With the advent of advanced laboratory methods for diagnosis of Pulmonary Tuberculosis (PTB), its detection now is increasingly relied upon rapid diagnostic methods like Cartridge based nucleic acid amplification test (CBNAAT) and Fluorescent Microscopy (FM). No study has been published regarding the effectiveness of CBNAAT and FM. This study aims to better the understanding of these methods for detection of PTB. The objective of the study was to compare CBNAAT and FM for detection of Mycobacterium tuberculosis (MTB) using sputum samples. **Methods:** A cross-sectional study was performed among 200 study population. 3 sputum samples from each patient were subjected to CBNAAT and 2 slide smears were prepared for Auramine-O stained FM. Statistical analysis was done using SPSS 23 by Chi square test. P value less than 0.05 was taken as significant difference for this study. **Result:** Thirty-three (17%) patients were positive by FM and 58(29%) by CBNAAT for MTB. Statistical analysis was done and the difference in positive yield was highly significant with P value <0.0001. Six (10%) patients were detected as Rifampicin resistance by CBNAAT out of which 2 were missed by FM. Among HIV patients 7(17%) were detected for MTB by CBNAAT and 1(2.5%) by FM. **Conclusion:** CBNAAT is a better method of detection as compared to FM in diagnosis of PTB.

**Keywords:** Gene Xpert MTB/RIF Cepheid, MDR-TB, Fluorochrome stain, LED fluorescent microscope

## INTRODUCTION

India has the highest burden of Tuberculosis (TB) with an estimated incidence of 2.2 million cases out of global incidence of 9 million.<sup>1</sup> There arises a need for rapid and more accurate diagnostic test for TB for prompt treatment and global TB control. In December 2010, World Health Organization (WHO) has endorsed Gene Xpert® MTB/RIF, a Cartridge based nucleic acid

amplification test (CBNAAT) which can diagnose active TB disease and multidrug-resistant (MDR) TB in less than 2 hour.<sup>2</sup> Gene Expert is a semi-quantitative nested real-time PCR in-vitro diagnostic test with two uses: (1) The detection of Mycobacterium tuberculosis DNA in sputum samples or concentrated sediments prepared from induced or expectorated sputum that are either acid-fast bacilli (AFB) smear positive or negative. (2) The detection of Rifampicin resistance associated mutations of the *rob* gene in samples from patients of Rifampicin resistance.<sup>3</sup> An alternative technique to Ziehl-Neelsen (ZN) smear microscopy is Fluorescent microscopy (FM), which is 8-10 % more sensitive than ZN smear microscopy and because AFB can be seen at lower magnification (40x), FM smears can be examined in a fraction (about 25%) of the time needed for ZN smears.<sup>4-6</sup> In 2010, the WHO recommended that LED FM be phased into replace ZN microscopy for TB diagnosis.<sup>7, 8</sup> This study will be the first publication from our institute after installation of CBNAAT. No such similar study has been published before and hence the aim of this study is to better the understanding of CBNAAT and FM as a diagnostic tool for detection of Pulmonary Tuberculosis. The objective is to compare CBNAAT (Gene Xpert® MTB/RIF) with Fluorescence microscopy in detection of Pulmonary Tuberculosis using sputum samples.

## METHODS

It was a cross sectional study in the Department of Microbiology, Jawaharlal Nehru Institute of Medical sciences, Imphal, Manipur

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from December 2016 to April 2017. Institutional Ethics Committee (IEC) approval was taken for the study and written informed consent was obtained from all participants for use of their sputum for TB diagnostics research.

Study subjects included patients with clinical suspicion of Pulmonary Tuberculosis including symptoms of Cough with or without expectoration for >2 weeks with evening rise of temperature and /or weight loss, fatigue, haemoptysis, loss of appetite. Patients referred from ICTC (Integrated counselling and testing centre) for detection of TB in PL HIV (people living with HIV/AIDS) and patients with prior history of TB and who are categorized as category 2 in DOTS programme of RNTCP were included. Patients who are 18 years of age were excluded from the study. Three sputum samples were collected from all 200 study patients (one spot sample, one morning sample in sterile disposable wide-mouth containers and another spot sample in falcon tube) for analysis. From the two wide-mouth containers, sputum smears were made on two slides and was stained with special stain (AURAMINE O). It was observed under fluorescent microscope using 40x objective lens for two minutes.<sup>9</sup> The acid fast bacilli (AFB) appeared as bright yellowish orange objects against a dark back ground and positive slides are reported as per RNTCP grading (Table 1).<sup>10</sup>

**Table 1** RNTCP Auramine-O fluorescent staining grading

GRADE	LED Fluorescence based sputum smear microscopy (400X Magnification: 11length = 40 fields = 200 HPF)
Negative	Zero AFB/1 length
Scanty	1–19 AFB/1 length
1+ grade	20–199 AFB/1 length
2+ grade	5–50 AFB/1 field on Average
3+ grade	>50 AFB/1 field on Average

The sputum samples from the falcon tube were treated with a sodium hydroxide and isopropanol containing sample reagent (SR). The SR was added to the samples at 2:1 ratio for raw sputum samples and incubated for 15 min at room temperature.<sup>11</sup> The treated samples were then manually transferred to the single-use plastic cartridges with multiple chambers that were preloaded with liquid buffers and lyophilized reagent beads and loaded into the Gene Xpert instrument. Remaining steps were fully automated. The cartridge incorporates a syringe drive, a rotary drive and a filter upon which Mycobacterium tuberculosis bacilli were deposited after being liberated from the clinical material. The test platform employs a sonic horn that inserts into the cartridge base to cause ultrasonic lysis of the bacilli and release of the genetic material. The assay then amplifies a 192 bp segment of the *rob* gene using a hemi nested RT-PCR reaction. CBNAAT and MDR positive will be based on the operational definitions.<sup>12</sup> The standard user interface indicates the presence or absence of M. Tuberculosis and the presence or absence of rifampicin resistance, and a semi-quantitative estimate of the concentration of bacilli as defined by the Cycle Threshold (CT) range (high, <16; medium, 16–22; low, 22–28; very low, >28).<sup>13</sup>

Statistical analysis was done using SPSS 23 by Chi square test.

P value less than 0.05 was taken as significant difference for this study.

## RESULT

In our study both the majority (40%) of the participants and the positivity for MTB (48%) fall under 41–60 years age range. Of the 200 sputum samples, 33(17%) were positive and 167(84%) were negative for MTB by FM. On the contrary 58(29%) sputum samples were detected by CBNAAT. Additionally, 6(10%) positive samples detected by CBNAAT were also detected with Rifampicin (RIF) resistance.

**Table 2** shows the comparison between CBNAAT (Gene Xpert) and FM. On statistical analysis, the Chi square value was 84.766 with 1 degree of freedom. Hence the difference in positive yield between CBNAAT and FM was found to be highly significant with P value <0.0001.

**Table 2** Comparison of CBNAAT with fluorescent microscopy

FLUORESCENT	CBNAAT		Total
	Mtb detected	MTB not detected	
Detected	32	1	Detected
Not detected	26	141	Not detected
Total	58	142	Total

**Table 3** Shows the correlation between CT range of Gene Xpert and RNTCP grading for Fluorescent smear microscopy. Out of 58 samples found to be positive for MTB, 26(48%) samples were missed by FM. Rest 32(55%) were detected by both methods. Only 1(0.02%) was missed by CBNAAT which was detectable by FM as 3+ grading.

**Table 3** Comparisons between cycle threshold (ct) range of CBNAAT and grading of fluorescent microscopy

Fluorescent	CBNAAT				Total
	Not detected	Low	Medium	High	
Scanty	0	0	4	0	4
1+	0	1	3	6	10
2+	0	0	1	4	5
3+	1	0	6	7	14
Not detected	0	15	10	1	26
Total	1	16	24	18	59

Out of the 40 HIV positive patients, 7(17.5%) were detected to be infected with MTB. All of them were detected by CBNAAT mostly under low category of CT value (22–28). Only 1(2.5%) was detected by FM under scanty grading.

Out of 27 DOTS category II TB patients (treatment failure or relapse or irregular anti-tubercular drugs intake), 14(52%) patients were detected by CBNAAT and 11(41%) were detected by FM. From the total of 6 MDR positive patients, 5 were of DOT category II patients. 3 patients were on irregular ATT and 2 with treatment failure. 2 sputum samples were missed by FM which was later detected by CBNAAT as MDR-TB under medium category of CT value.



## DISCUSSION

Tuberculosis was more common among the younger age group of 25-35 years. But recently the trend has shifted towards the older age group. The 2010 Global Burden of Disease estimates show that 57% of all tuberculosis deaths globally occurred among people older than 50, with more than half of these deaths in those aged 65 and above.<sup>14</sup> In our study maximum positivity for MTB was found in age group 41-60 years age range. This may be ascribed to increased life expectancy and waning immunity in adults. In this study CBNAAT could give a maximum positivity of 29% as compared to 17% of FM. And among these 26 positive samples that were missed by FM, maximum (15 samples) falls in low category of CT value (22-28). This low category signifies lower numbers of MTB bacilli or paucibacillary in these sputum samples. Hence CBNAAT could diagnose PTB in older adults who have sputum smear negative pulmonary tuberculosis that were harder to diagnose and treat than conventional pulmonary tuberculosis.

The fact that FM has difficulty in detecting paucibacillary can be attributed to the fact that only a loop-full of sputum sample was taken to make the smear slides for FM. While 2ml sputum sample for CBNAAT was used for the process. This attribution can be easily avoided with the process of concentration and decontamination of sputum. But it was not done in this study as we were following the RNTCP grading for FM. In a study by Navinchandra, he found out that the sodium hypochlorite concentration technique leads to 44.11% increase in detection of new cases as compare to routine RNTCP method. He even suggested the use of this process in smear negative sputum samples if not all the samples.<sup>15</sup> MTB detection by FM could have been even higher if we also employed a decontamination and concentration method in our study. We propose adoption of decontamination and concentration method by RNTCP for FM and devise a grading system for the same.

In our study 10% of the sputum sample was detected with rifampicin resistance by CBNAAT. This finding was similar with others reported from Punjab (9.9%), Jaipur (11.09%), and Lucknow (27%).<sup>16</sup> For early detection of Rifampicin resistance this assay is useful and hence early intervention can be done. CBNAAT was a better diagnostic test when it comes to diagnosing DOTS Cat II patients. FM could not detect 3 Cat II patients, out of which 2 were MDR strain. And hence it is of utmost importance that Cat II patients be confirmed with CBNAAT.

As our state is one of the six highest HIV prevalent states in India and TB being endemic here, HIV-TB co-infections are expected to rise. It is mandatory to test for TB infection in a HIV positive patient before the initiation of antiretroviral therapy (ART).<sup>17</sup> In this study, 7 patients with HIV infection were detected with TB. All of them were detected by CBNAAT mostly under low category of CT value (22-28). Only 1 was detected by FM under scanty grading. This could be explained as the atypical presentation of HIV and pulmonary TB co-infected patients, who presents with non cavitory lesions of the lungs giving rise to paucibacillary sputum samples.<sup>8</sup>

Even though FM can be reported within 30 min time, it is limited

to skilled technical expertise at every step from smear preparation and staining to interpretation of the stained slides under FM. There are more chances of false positive result in FM due to the artefacts which are interpreted at the subjective level. On the other hand, CBNAAT does not required skilled technician or the extensive set up in the laboratory for the prevention of amplicon contamination and does not have any pipetting error so there is less chance of false positive results.

Since MTB culture (which is the gold standard for diagnosis of TB) was not included in the study, the sensitivity and specificity of each test was not determined. One sample which was not detected by CBNAAT was found to be positive with 3+grading in FM. This may be attributed to Non Tubercular Mycobacterium (NTM). In a study by Paul W. Wright, FM cannot differentiate between NTM and MTB which he confirmed using culture.<sup>18</sup> It was not confirmed as culture and identification was beyond the scope of this study. Further study is contemplated using culture and identification.

## CONCLUSION

In comparison to FM, CBNAAT is more useful in detection of Pulmonary Tuberculosis as it helps in detection of paucibacillary MTB. An additional feature of rifampicin resistance can also be detected by CBNAAT. This study highlights the importance of setting up CBNAAT at every district level of health care centre and all medical institutes for early and accurate detection and prompt treatment of TB.

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## ORIGINAL PAPER

# Dermatoglyphics in Vitiligo

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## ABSTRACT

**Introduction:** Dermatoglyphics is the study of dermal ridges and the patterns formed by them. **Aims:** Here, we have compared dermatoglyphic patterns in patients with vitiligo and gender matched control population, and tried to find out if any of the dermatoglyphic patterns is more commonly associated with severe disease. **Methods:** A total of 100 clinically diagnosed cases of vitiligo were included along with 100 gender matched controls. Fingerprints were recorded using the Ink method of Purvis and Smith. Rolled fingertip prints as well as palm prints were taken and studied using a hand lens. Parameters studied were pattern types (loops, arches and whorls), a-b ridge count, atd angle. Analysis of dermatoglyphics was done by forensic experts. **Results:** Loops were the commonest pattern noted in both cases and controls. The study population showed increased incidence of whorls, predominantly on the 4<sup>th</sup> digit, and arches on 2<sup>nd</sup> digit as compared to controls. Patients with generalized vitiligo showed more than two whorls as compared to those with localized disease. Mean a-b ridge count and mean “atd” angle did not show any significant difference compared to controls. **Conclusion:** We concluded that patients with vitiligo have a higher incidence of whorls and those with more than two whorls may have a higher risk of developing generalized disease. Further large scale studies including both affected and unaffected first degree family members and long term follow up of these patients are required to corroborate our results.

**Keywords:** Dermatology, loops, whorls, arches, genetic diseases

## INTRODUCTION

Dermatoglyphics is the study of dermal ridges and the patterns formed by them.<sup>1</sup> The ridges are formed during the fourth month of foetal life and are useful in the diagnosis of hereditary diseases.<sup>2</sup> Doctor Harold Cummins is universally acknowledged as the Father of Dermatoglyphics. Galton described three main types of fingerprint patterns:-Arch, loop and whorl.<sup>3</sup> Dermal

Ridges are known for their uniqueness, persistence through out life irrespective of age and hence have a lot of implications ranging from legal matters, biometrics for staff management, finger print sensors and many more. Today, dermatoglyphics is being studied to support the diagnosis of many genetic diseases, psychiatric diseases and cancers. There is a relative paucity of studies in dermatological conditions. We have made an attempt to diagnose a hereditary condition, vitiligo; included in our study are those afflicted by the disease and gender matched controls. The incidence of vitiligo is reported to be 0.25-2.5% in India.<sup>4,5</sup> Gujarat and Rajasthan states have the highest prevalence ~ 8.8%.<sup>6,7</sup> It has a polygenic or an autosomal dominant inheritance pattern showing variable expression.<sup>8-10</sup> Vitiligo is defined as a focal failure of pigmentation due to destruction of melanocytes that is thought to be mediated by immunological mechanisms.<sup>11</sup>

## METHODS

We conducted a cross sectional observational study including a hundred clinically diagnosed cases of vitiligo attending dermatology outpatient department of a tertiary care hospital and a hundred sex matched controls. Though dermatoglyphic

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patterns are not age dependent, there have been some differences in these patterns in individuals of different sex. Hence we included controls which were sex or gender matched.

**Exclusion Criteria** - Patients and controls with hand dermatitis or any other lesions obscuring the finger print patterns. Also, patients not willing to give finger prints were excluded.

After explaining the aims and objectives of the study to the patients and obtaining willful consent they were included in the study. Detailed history and examination was done to identify the type of vitiligo, stability of the disease and family history. Both patients and controls were asked to wash their hands clean with tap water. Fingerprints were recorded using the Ink method of Purvis and Smith.<sup>12</sup> A glass plate, 12 by 12 inches, was cleaned and smeared with printers ink with the help of a roller. Each fingertip was pressed against the glass slab spread with ink so as to stain the ink over fingers and fingerprints were taken by pressing them over a clean white paper. Rolled fingertip prints as well as palm prints were taken and studied using a hand lens by forensic experts.

The fingers were numbered from right thumb to right little finger (1 to 5 respectively) and left thumb to left little finger (6 to 10 respectively).

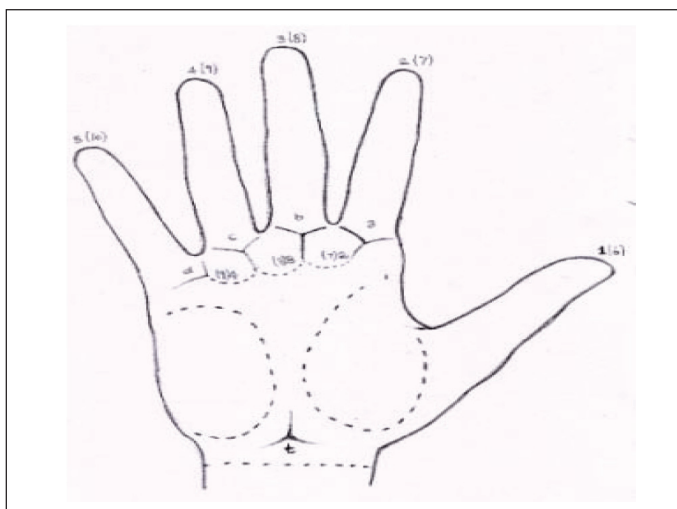
Parameters studied were type of dermatoglyphic patterns (loops, arches and whorls), a-b ridge count (a, b, c, d are triradii at base of digits except thumb), add angle (t - triradius at base of palm) as shown in figure 1. The a-b ridge count also known as inter-radial interval was obtained by counting the number of ridges between “a” and “b” triradius points.

Triradius is formed by confluence of three ridge systems. (a,b,c,d are digital triradii at base of digits except thumb).

The add angle - Angle formed by joining lines from digital “a” and “d” to axial triradius “t” (t - triradius at base of palm) as shown in figure 1.

Statistical method used was t test, Levene’s test.

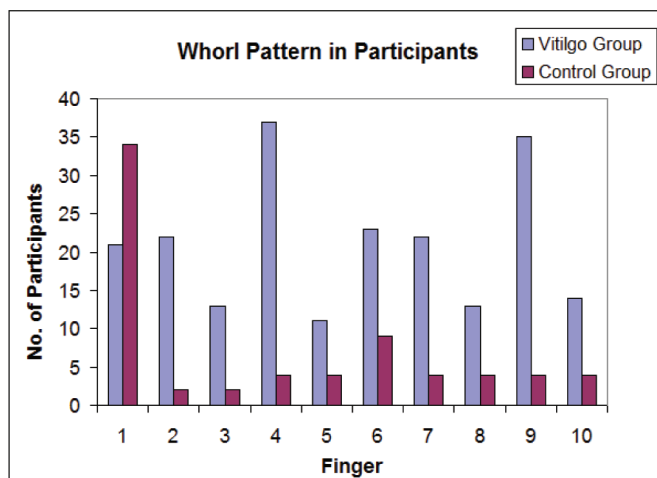
P value < 0.05 was taken to be significant.



**Figure 1** Counting of fingers from thumb to little finger (1-5 of right hand and 6-10 of left hand), tri radii at the base of figures (a, b, c, d), tri radii at the base of palm (t) and add angle measure.

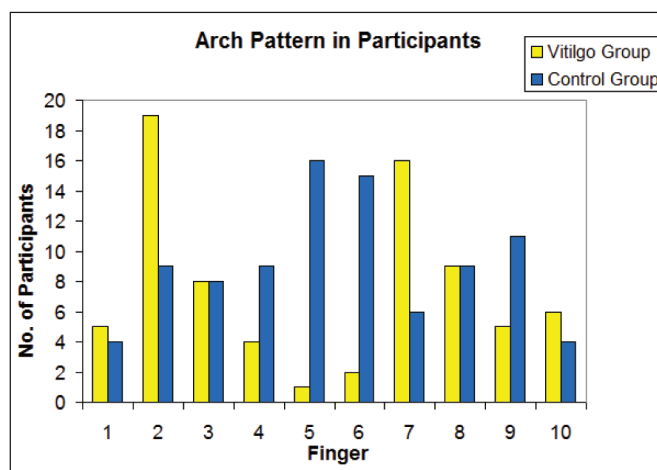
## RESULTS

Since it was a gender matched study, both Vitiligo (Case) group and Control group had an equal number of male and female Participants. Family history of vitiligo was present in 16% of the case group; slightly less than the 21.93% in a study by Shajil et al.<sup>13</sup> Amongst the study population, 30% of the patients had unstable disease while rest 70% had stable disease. There were 61% patients with generalized vitiligo while 39% had localized disease, similar to the reports of Koranne et al<sup>14</sup> and Sarin et al<sup>15</sup> where generalized vitiligo was found to be more common. There was no significant difference in loop pattern in cases & controls in our study.



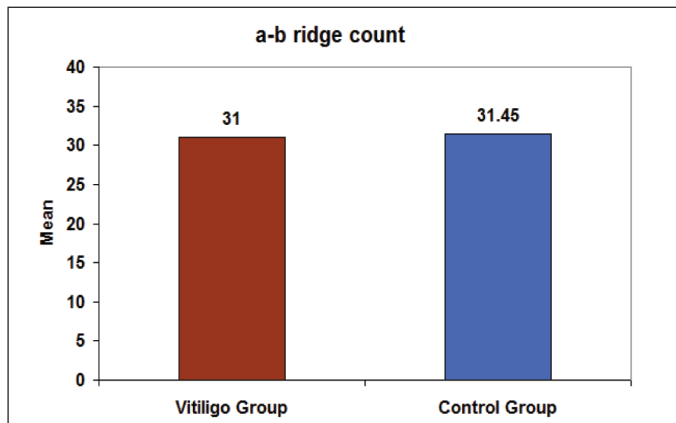
**Figure 2** Whorl patterns in all the fingers

Except in **Figure 1**, whorl pattern was more commonly seen in Vitiligo group as compared to Control Group and it was statistically significant ( $p < 0.05$ ).



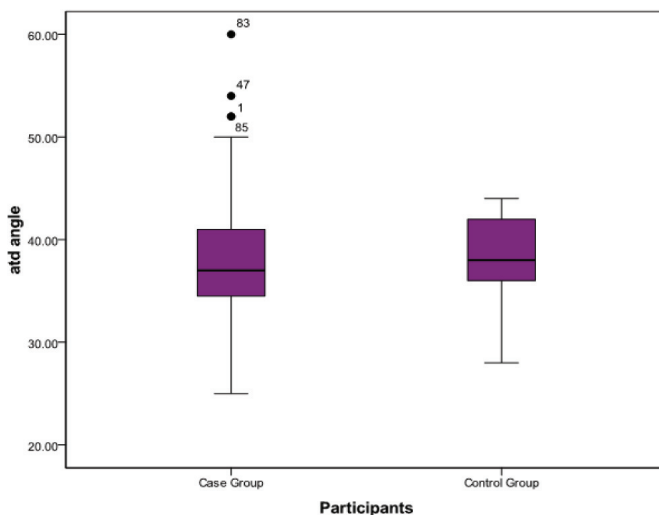
**Figure 3** Arch patterns in all fingers

“Arch” pattern was more common in Vitiligo (Case) Group as compared to Control Group in fingers 2 and 7; it was statistically significant ( $p < 0.05$ ). In contrast, Fingers 5, 6 & 9 showed “Arch” pattern more in Control group as compared to Vitiligo (Case) Group ( $p < 0.05$ ).



**Figure 4** Difference in a-b ridge count in cases and control group

The difference in a-b ridge count in Vitiligo (Case) Group & Control Group was statistically not significant ( $p > 0.05$ ).



**Figure 5** Add angle in cases and controls, difference between which was statistically insignificant

**Table 1** Showing no. of whorls in patients with generalized and localized vitiligo

Type of Vitiligo	Total No. of Whorls		Total
	Less than 2	More than 2	
Generalized vitiligo	34	27	61
Localized vitiligo	34	5	39
Total	68	32	100

(Chi Square = 10.80, Degree of freedom = 1,  $p$  value = 0.001, statistically significant)

Generalized vitiligo was commonly seen in cases with more than 2 whorls in both hands. ( $p < 0.05$ ). Thus presence of more than 2 whorls in both hands may be associated with occurrence of generalized disease in vitiligo patients.

## DISCUSSION

Dermatoglyphic studies have been conducted on various other dermatomes such as psoriasis, alopecia areata, Darier's disease,

ichthyosis, atopic dermatitis, anhidrotic ectodermal dysplasia and eczemas.<sup>16-18</sup> There is a paucity of data on study of dermatoglyphics in vitiligo and sample size of available studies is also small.

There was increased incidence of ulnar loops on the 5<sup>th</sup> digit as compared to controls, in the study done by Kumar P & Gupta A<sup>19</sup>, Sahasrabuddhe *et al*<sup>20</sup> and Singh *et al*<sup>21</sup> while there was no such difference in our study. In our study, no significant difference was found in the mean a-b ridge count, as was found in the study performed by Kumar P & Gupta A. Also, there was no significant difference in add angle between cases and controls in our study while a significant decrease was noted in the mean add angle in females of vitiligo (37.97) when compared with control females (42.20) in the study by Kumar P and Gupta A. The arch pattern was more common in fingers 2, 7 of the cases as compared to controls in our study. There was no significant difference in the dermatoglyphic patterns and a-b ridge count in cases and controls in study by Verma KC and Jain VK.<sup>22</sup> In our study, presence of more than two whorls was observed in patients with generalized disease, a finding not reported in the previous studies. In a study by Tabhane *et al*, vitiligo patients exhibited increase percentage of whorl pattern on first finger followed by second finger in both the sexes.<sup>23</sup> In our study, vitiligo group exhibited increased whorl pattern on second finger but not on the first. Karnul *et al* reported that ATD angle in both hands of vitiligo males & right hand of female vitiligo cases reduced significantly,<sup>24</sup> contrary to our study where no significant difference in the add angle was noted between cases and controls. The mean value of add angle was increased in vitiligo males and females on both sides in a study by Kar *et al*.<sup>25</sup>

## CONCLUSION

Patients with vitiligo have a higher incidence of whorls in their dermatoglyphic pattern than controls and those with more than two whorls may have a higher risk of developing generalized disease. Thus we suggest that number of whorls may be considered as a prognostic factor for cases. There was a higher incidence of arches on second and seventh finger in cases. There is no significant difference in the mean a-b ridge count and add angle among cases and controls. We suggest further studies including both affected and unaffected first degree family members, involving a larger study population and long term follow up to support our results, which might help in predicting the severity of the disease and we plan to continue our efforts in same direction.

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the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. All the authors have contributed as follows:

Dr. Prachi Gole – Examination and Diagnosis of Vitiligo cases, Conception of Idea, Collection of Data; Dr. Bhalchandra Chikhalkar – Conception of Idea, Interpretation of Data; Dr. Siddhi Chikhalkar – Examination and Diagnosis of Vitiligo Cases; Dr. Sandeep Haridas – Interpretation of Data, Statistical Analysis; Dr. Swapnil Sanghvi – Examination and Diagnosis of Cases; Dr. Uday Khopkar – Confirmation of Diagnosis and Mr. Kuber Bhinde – Collection of Data, Statistical Analysis of Data.

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## ORIGINAL PAPER

# Age estimation of rescued female commercial sex workers and male child laborers in South India

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### ABSTRACT

**Introduction:** Children around the world are engaged in forms of work and were forced into prostitution every year. **Material and methods:** Physical examination, radiographs depicting skeletal and dental parameters have been used to estimate the biological age of 85 male child laborers and 19 female commercial sex workers. The radiographs analyzed by two separate forensic experts using skeletal and dental assessment methods. A statistical analysis was performed to analyze differences between reported and assessed ages. **Result:** 33(39%) out of 85 individuals had reported ages lower than the estimated biological ages. In 24 cases, the reported age was less than 14 years, but only 20 individuals were confirmed. It was observed that the 8 out of 19 individuals were identified minors (below 18 years). **Conclusion:** The results showed a significant difference between reported and assessed ages ( $p < 0.001$ ); however, no statistical difference was shown between skeletal and dental age.

**Keywords:** Forensic science, Dental age, skeletal age

### INTRODUCTION

Cross border migrations, criminal investigations, asylum seekers, employment, claiming social benefits, unavailability of valid documentations is named to be few among many reasons for age estimation. These makes age assessment as an integral part of forensic practice. In criminal investigations, the authorities promptly request the forensic experts to determine whether if the person attained the age of importability. As per Indian constitution and article 24 dealing with fundamental rights of children, "Prohibition of Employment of Children in Factories, no child below the age of 14 years shall be employed to work in any factory or mine or engaged in any other hazardous employment."<sup>1</sup> According to this law the child must attain "majority" for the purpose employment at the age of 14 years, which means that children from 14 to 21 years are permitted to work and their labour is legal.

Children around the world are engaged in various paid and unpaid forms of work and are classified as child laborers. An estimate of 150 million children worldwide is engaged in child labour. Around 13 per cent of children aged 5 to 14 in developing countries are involved in child labour.<sup>2</sup> In India there are close to 4.3 million child labors working as per census 2011 by ministry of labour and employment.<sup>3</sup> Most of these children were sent to work by compulsion and not by choice, mostly by parents.

Child prostitution is another major problem in India. There are approximately 2 million child commercial sex workers between the age of 5 and 15 years and about 3.3 million between 15 and 18 years. Section 375 Indian Penal Code considers age of 16 years as the right age of consent to decide the criminality of the offence of rape. In the case of marriage, sex with a female of 16 years or younger is considered rape.<sup>1</sup> Thousands of children were forced into this profession every year and unknowingly they get trapped into this trade even before puberty.

This study involves the ascertainment of the ages of children rescued from child labour and prostitution. The objective is to assess the skeletal and dental ages and to verify the similarities or differences between the skeletal and dental assessments. To achieve this, orthopantomograms (OPGs) and Left hand/wrist radiographs were taken, analyzed and then statistical analysis was done to compare the reported and assessed ages.

### METHODS

The authors have carried out a retrospective review on a sample of 85 male child laborers and 19 female commercial sex workers

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(CSWs). These children were intercepted by the police during investigation as a part of Operation Muskaan. Its objective is to trace down missing and destitute children and to reunite them with their families.<sup>4</sup> These children were arrived from various parts of the country mostly the southern India which includes Andhra Pradesh, Telangana and Orissa. Forensic age determination was requested by local authorities and the Department of Forensic Medicine & Toxicology of Osmania Medical College was contacted in order to ascertain if the subjects in question have achieved the required legal age. Data gathered from January 2014 to December 2015 were used in our analysis. The age determination procedure began with a clinical assessment of the individuals, which consisted of a physical examination, which recorded anthropometric data, signs of sexual maturity. Skeletal development, which was evaluated by means of radiologic examination of the left hand/wrist, and the dental examination, which included the inspection of the oral cavity and the assessment of an OPG, were also used in determining the biological age of the individuals. An additional shoulder and pelvic X-ray was also carried out.

Physical maturity was assessed based on height and weight of the individual, using Tanner Staging System. This system is commonly used to determine the status of genital development, breast development and level of pubic hair growth.<sup>5</sup> Skeletal age estimation was carried out using the hand/wrist radiographs of the left hand. These x-rays used to evaluate the shape, size and fusion/ degree of ossification of the bone elements using an atlas method named, Greulich and Pyle method.<sup>6</sup> The pelvic and shoulder X- rays were taken as supplementary to skeletal assessment of the age of the individual.

To check the eruption status and maturity of the developing teeth, a clinical (intraoral) examination was carried out followed by the analysis of OPGs. For younger individuals, age estimation was more accurate due to the presence of many developing teeth; particularly the canines, premolars, as well as first and second molars that make dental age estimation of these subjects more accurate.<sup>7</sup> Hence for younger individuals, the Schour and Massler<sup>8</sup> classification method, the Demirjian et al. method<sup>9</sup> were used. In case of older individuals, where all the teeth were matured except third molars, the ABFO (American Board of Forensic Odontology) classification guidelines were used. This classification system utilizes Demirjian's schematic definitions of crown and root formation and thus evaluates the radiological development of the third molar.<sup>10</sup>

The procedures for skeletal and dental examinations were carried out separately by two different specialists: forensic medicine specialist and a forensic Odontologist. Their results were compared in order to determine the probable age of the individual. This was achieved by a concord decision taking all evidence into account. BMI and secondary sexual traits were analyzed so that they can be used as a means of supplementary information for age assessment. In cases where it was the subjects obtained 14 years age through skeletal and dental methods, they were given the benefit of the doubt and assigned the younger age.

Statistical analyses were performed in order to verify differences

or similarities between skeletal and dental ages and those of reported and assessed ages. To determine if the age was distributed along a normal curve, the Kolmogorov–Smirnov test was used. To test normality p-values less than 0.01 were considered significant. Following this, a comparison of the two groups (reported age and biological age) was performed by means of the t-test. P-values less than 0.05 were considered significant. Statistical analysis was performed using SPSS 20 statistical software package.

## RESULTS

### CHILD LABOURERS

Results has revealed that 33(39%) out of 85 individuals had reported ages lower than the estimated biological ages. In 24 cases, the reported age was less than 14 years, but only 20 individuals were confirmed by radiographic examinations (OPGs and hand/wrist X-rays). The agreement between the reported and the estimated biologic ages was seen in 17 individuals, out of which 15 subjects belongs to 14- 18 years, one is less than 14 years and one is above 19 years. (**Table 1**)

The results of tests of normality (Kolmogorov–Smirnov test) has revealed that samples were distributed along a normal curve ( $p=0.042$ ). The result of student's t- test has revealed statistically significant difference between the alleged age and the estimated biologic age ( $t= 10.447$ ;  $p< 0.001$ ).

### COMMERCIAL SEX WORKERS (CSWs)

The estimated biologic age of the CSWs ranged from 14 to 21 years of age. It was observed that the 8 out of 19 individuals were identified minors (below 18 years). 3 individuals who reported as majors were confirmed minors by skeletal and dental radiographic examinations. But one subject, who reported as a minor, was confirmed as major with a greater discrepancy of 6 years (**Table 2**).

The results of tests of normality (Kolmogorov–Smirnov test) has revealed that samples were distributed along a normal curve ( $p= 0.031$ ). The result of student's t- test has revealed statistically significant difference between the alleged age and the estimated biologic age ( $t= 10.132$ ;  $p< 0.001$ ).

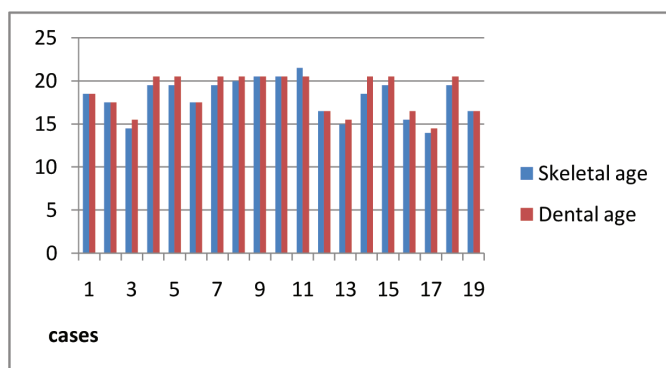
**Table 1** Results of investigations of child laborers

Age	Reported No. of subjects	Assessment confirmed biologic age	Agreement between reported & estimated ages
< 14 years of age	25	33	1
14 to 18 years of age	59	51	15
> 18 years of age	2	1	1

**Table 2** Results of investigations of female commercial sex workers

Age	Reported No. of subjects	Assessment confirmed biologic age	Agreement between reported & estimated ages
< 18 years of age	7	8	1
> 18 years of age	12	11	1

**Figure 1** Estimated skeletal and dental age of female CSWs



**Figure 1** Estimated skeletal and dental age of female CSWs

## DISCUSSION

Child labour is a pure violation of huge range of rights of children which are being snatched perhaps every nook and corner that can be associated with the labour work. Child prostitution is another major problem in India. Sex workers who involved in this line of work are named call girls, escort girls; a gigolo (role reversal) etc., And in some places of southern India this practice named Devadasi system or sacred prostitution.<sup>11</sup> These practices of prostitution are deeply rooted in India, with children are forced to enter into this profession at younger ages (even before puberty). Entry into this profession in India is 3 fold. Firstly, born and brought up into this trade as family profession. Secondly young women from rural areas and other countries are deceived, sold and dragged against their will. Finally, some women chosen this area of work because of given limited options they had and to support their families.<sup>12</sup> Once entered into this trade they are subjected to physical and mental torture and cannot abscond easily. It is of paramount importance to save these children from these professions and to create an enabling environment for them.

Analysis of the data disclosed significant correlation between the ages determined using the skeletal and dental structures. Age assessment using teeth is into practice since longtime. The initiation of tooth development and various phases that follow through in this process are used as markers in age determination. Skeletal age assessment goes hand in hand with dental analysis along with other methods, as age determination of an individual is an interdisciplinary approach in forensic approach. This involves the services of forensic pathologists, Odontologist, anthropologists, radiologists and legal medicine.<sup>13</sup> All these methods recommended to use in combination for the purpose of increasing the accuracy in age estimation and to facilitate the identification of age relevant developmental disorders.<sup>14</sup> The process of dental development correlates with morphological stages of tooth development that can be seen using radiographic techniques. These stages follow uniform and gradual changes, which are more controlled by genetics and less influenced by external factors than all other measurable criteria of maturity.<sup>15</sup> Unlike skeletal and sexual maturity indicators, dental development is less susceptible to hormonal, nutritional and pathological

changes.<sup>16</sup>

Physical examination includes measuring body height and weight, BMI and in times it also describes any signs suggestive of pathological conditions which effect the maturation of the individual. But this additional information can be quite useful for individual's younger than 14 years of age as the elders have already gone through puberty.<sup>17</sup> In the present study, physical examination and signs of sexual maturation were used to gain additional information particularly for child laborers who claimed to be below 14 years. The results of this study revealed that there is no discrepancy is seen in only 17 out of 85 individuals between reported and estimated ages (**Table 1**). Remaining all subjects (80%) either over or under reported their ages. This mandates the application of decisive methods for age estimation and to obtain unerring results. Most of these child laborers during examination mentioned that they want to get back to their professions because of their family economic issues.

For older individuals, whose all teeth were mature at 14 years of age, the authors adopted classification guidelines proposed by ABFO for age assessment of for commercial sex workers. This method is based on the sole evaluation of radiological developmental of 3<sup>rd</sup> molars which sub divides the tooth development into eight stages of A- H. (10) Pelvic x- rays were taken for sub adult individuals assuming that iliac crest usually appears at 16 years in males and 15 years in females, and fuses with the iliac bone at 19 years.<sup>18</sup> The results revealed that 8 out of 19 individuals were minors (below 18 years). The range of variation between the skeletal and dental ages is in the range of +/- 12 months (**Figure 1**). But one subject, who reported as a minor, was confirmed as major with a greater discrepancy of 6 years. Many studies stated that around 30 to 90 percent of women and girls are below 18 years of age at the time of exploitation. In India, it assumed that the number of women and children in this trade ranged from 70,000 to 1 million. Out of this 25% are below 20 years, 15% are entering at age of 15 years and 25% of them are between 15 to 18 years.<sup>19</sup> A study carried on 26 CSWs with HIV reported that the 1/3rd of them were minors.<sup>20</sup> Like other studies our results also suggested that 47% (9 out of 19 individuals) are minors.

The child laborers in this study are from southern India which includes Andhra Pradesh, Telangana and Orissa. The CSWs are from the state of Andhra Pradesh and Telangana. All the young individuals that are rescued were sent to juvenile homes for rehabilitation.

## CONCLUSION

The findings of this retrospective analysis demonstrate the vital role of standardized methods for age estimation in living individuals. Dental age estimation using the Demirjian's population specific formula for Indian population and ABFO classification guidelines showed reliable outcome as they did not show much variation from the skeletal age. Our study further highlighted the imperative role of utilization of multiple indicators for age assessment. Results showed that 39% of children were below 14 years of age and 47% of the females were minors who trapped into these professions under various circumstances.



Credible efforts must be made at administrative level to eliminate the problem of child Labour. Rescue, rehabilitation and providing education for these children are of greatest importance.

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**Ethical clearance:** Taken.

**Conflict of interest:** None.

**Authors contribution:** We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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## ORIGINAL PAPER

# Impact of antenatal care on postnatal outcomes among postnatal women in a selected district hospital, Assam

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### ABSTRACT

**Introduction:** Maternal mortality rate in developing countries has almost defied the advance made by health care facilities. Such unfortunate deaths can be barred radically by providing state of the art antenatal, natal and postnatal care. This study is designed to recognize the impact of antenatal care on the outcome of the postnatal women in relation with a number of key parameters. Furthermore, it also aims to understand the association between antenatal cares with a set of selected demographic variables. **Methods:** This study was undertaken by adopting System Model as the conceptual framework. Simple random sampling technique was used to select 100 postnatal women in a selected hospital in Assam. Semi structured interview schedule, record analysis and physical assessment proforma were used to collect information. **Results:** Most of the postnatal women had at least three antenatal visits for complete physical and obstetrical examination. However, hemoglobin and other routine blood investigations, urine testing and USG were found only for few. Iron and folic acid supplementation was not received by some postnatal women. Adverse postnatal outcomes present among the postnatal women were maternal hypertension (4%); PPH (6%), maternal distress (14%), and fetal distress (28%), still birth (8%), neonatal death (1%) and low birth weight (22%). **Conclusion:** Significant association was found between occupation and total family income of the postnatal women with the number of antenatal checkup. Numbers of antenatal visit and live birth were found to have a direct association with complete obstetrical examination and birth weight, Hb estimation and PPH, occupation and birth weight. **Keyword:** Antenatal check-up, nursing practices, maternal morbidity

### INTRODUCTION

Maternal mortality is a critical index of woman's health and good indicator of the performance of health care system. The risk of dying a woman during her pregnancy in a developing country

is a whopping 200 times higher than developed countries.<sup>1</sup> The five direct causes, accounting for 75% of total of maternal deaths in developing countries are: haemorrhage, sepsis, PIH, obstructed labour, and complication of unsafe abortion.<sup>2</sup> About 20% of the women are encountered for at least one obstetrical complication or death during delivery and post-partum period.<sup>3</sup> Recent study confirms that 80% of the pregnancy related complication and the maternal deaths can be prevented by providing access to good quality antenatal, natal and postnatal care.<sup>2</sup> The global antenatal care coverage between 1996 and 2004 was 71%, as contrast to 60% in India. Also, while the deliveries conducted by skilled personnel in the global scenario are around 63%, it reduces to 43% in India. According to UNICEF during 2007-2012, antenatal care coverage was at least one visit for 74% women, at least four for 37% and the skilled attendant during birth was 52%. Recent studies indicate that women with lower education and lower income groups are more likely to have less than three antenatal checkup.<sup>4, 5, 6</sup>

A significant association is observed in the reduction in proportion of women obtaining antenatal care services with increasing age, parity, number of living children. Institutional delivery is practiced among maximum number of women who avail antenatal care (51.7%) in contrast to those without antenatal services (21.6%).<sup>7</sup> It has been reported that there is no significant association between skilled delivery attendances with reduction in maternal mortality or stillbirth rates until coverage rates of about 40% are achieved. Furthermore, four or more antenatal visit is not correlated with reductions in maternal death, if

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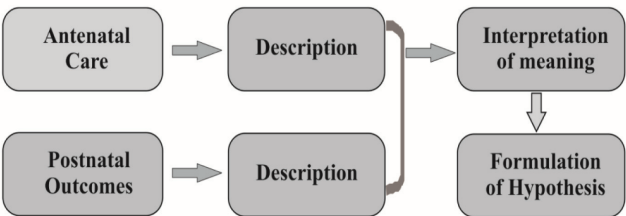
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coverage is less than 60%.<sup>3</sup>

The present study aims to identify the nature of antenatal care received, and to recognize the outcome of the postnatal women in terms of nature of delivery, maternal and baby condition up to 24 hours following birth. It endeavours to see the association between utilization of antenatal care with selected demographic variables of the postnatal women, and secondly, between utilization of antenatal care with the postnatal outcome.

**METHODS**

**Study design and area:** The study was conducted in the district hospital of Golaghat district of Assam, which accounts for 37.6% of total institutional deliveries of the district. The present study adopts survey approach and retrospective descriptive method (Figure 1), to accomplish the objectives of the study.



**Figure 1** Schematic representation of research design for the present study.

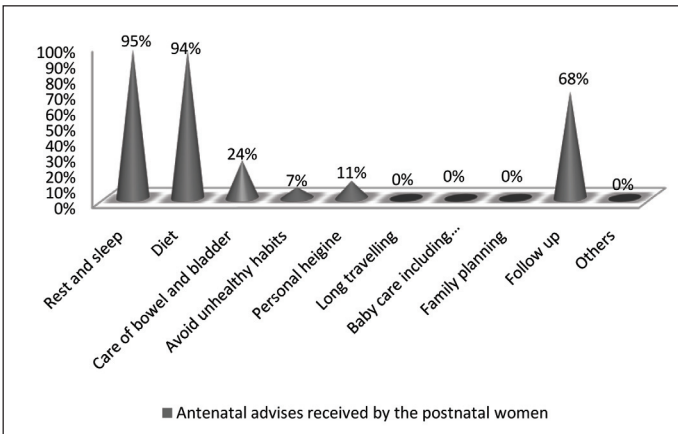
**Study population and sampling:** Postnatal women who had delivered in the Golaghat District Civil hospital during the study period were considered as population sample. The sample size is calculated by using the formula:  $n = \frac{4pq}{l^2}$ ; where  $p=54.6$  (institutional delivery rate),  $q=(100-p)=45.4$ ,  $l=20\%$  of  $p=10.92$ .<sup>8</sup> The  $n$  value was calculated as 83.<sup>9</sup> Our study is descriptive, and thus to overcome the possibility of non-responses, 20% more sample was added. Total 100 postnatal mothers who had delivered and were in the postnatal ward following 24 hours of delivery were selected.

**Data collection tools and techniques:** We developed three tools: i) semi-structured interview schedule, for background information of the postnatal information and care received during antenatal period, ii) structured record analysis proforma, for information about antenatal care, and iii) physical assessment proforma, for physical condition of the postnatal women and their new-born within 24 hours of delivery.

**RESULTS**

**Demographic profile and antenatal care received by the postnatal women:** The postnatal women (100) surveyed were in the age group of 19 to 35 year. Majority (70%) of them were Hindu and 50% received education till primary level. 86% were housewives and 71% had income group of Rs. 1,000.00-3,000.00 per month. About 94% had either three or more antenatal visit, but only 29% received their first antenatal check-up before 12 weeks of gestation. We found that 92% had taken two doses of injection Tetanus Toxoid and prophylaxis iron and folic acid were received by 93%. We identified the following minor health problems faced during antenatal period: insomnia, headache, pain in the epigastric region, scanty urination (1%), insomnia, headache,

pain in the epigastric region (2%), headache, scanty urination, pain in epigastric region (1%), only scanty urination (1%), only pain in the epigastric region (1%), and hyperemesis gravidarum (2%). Total 9% postnatal women had bad obstetrical history; for example, 2% had history of still birth, 1% had abortion, 6% reported caesarean section. Complete physical examination (i.e., blood pressure, weight, and oedema) was done by 51% of postnatal women, and 23% did complete blood investigation (sugar, grouping, serology). Urine testing and USG was done for 24% and 23%, respectively. Also, among the 24% who did urine testing, 4% had trace amounts of protein, but action was received only for 1%. **Figure 2** shows the data for antenatal advices received by the postnatal women. Haemoglobin estimation was not done for any of the postnatal women during first trimester of pregnancy. However, during second trimester haemoglobin was estimated for 8% of women, and haemoglobin level was between 8 to 10 gm% (mild anaemia). At third trimester haemoglobin estimation was done for 44% postnatal women, and 27% reported haemoglobin level between 8 to 10 gm% (mild anaemia), 10% had either 7 gm% or less than 8 gm% (moderate anaemia), 2% had less than 7 gm% (severe anaemia), whereas only 5% were detected without anaemia ( $> 10$  gm%).



**Figure 2** Advice received by the postnatal women during antenatal period (N = 100)

**Evaluation of intranatal and postnatal outcomes:** 73% of the postnatal women had spontaneous vaginal delivery, where 56% were full term, 15% were post-dated and 2% were preterm. The total duration of labour was 6-12 hours for 57%, and 13-16 hours for 16%. We found 4% and 6% had hypertension during intranatal and postpartum period, respectively, and while 14% had maternal distress and 28% recorded foetal distress. Also, out of 100, 8 babies were still births, 23 had asphyxiated at birth and the rest (69) were normal. 75% of the new-borns weight between 2.5 to 3.5 kg, 22% had less than 2.5 kg. Also, 22% were small for gestational age, whereas only 3% had more than 3.5 kg birth weight. Further more, two newborns died within 24 hours of delivery, one of them had birth asphyxia and was small for gestational age while other had weighed more than 3.5 kg with severe congenital anomaly (anencephaly). Remaining 90% postnatal women who had live new-born, only 49% were successful in breast feeding and 63% were able to take care of



their baby. Data regarding maternal conditions within 24 hours of delivery are presented in **Table 1**.

**Table 1** Frequency distribution of maternal condition within 24 hours (N=100)

Sample characteristics	Frequency
Dehydration	49
Pallor	92
Blood pressure	
Hypo tension	18
Norm tension	80
Hypertension	2
Condition of the nipple	
Normal	68
Inverted	17
Cracked	0
Inverted and cracked	6

**Evaluation of impact of antenatal care on postnatal outcome:** Our analysis reflects a significant association between number of antenatal checkup with occupation of the postnatal women and total family income (**Table 2**).

**Table 2** Chi-square value for the association between the demographic profiles and number of antenatal checkup (N = 100)

Selected demographic profile of the postnatal women	No. of antenatal visit		Total	Chi- square value ( $\chi^2$ )
	< 3	• 3		
Level of education				.50
No formal education	2	13	15	
Primary and above primary level	4	81	85	
Occupation of the postnatal women				19.73*
Labourer	5	9	14	
Housewives	1	85	86	
Family income per month				12.07*
-< 1000	5	15	20	
-• 1000	1	79	80	

$c^2 df(1) = 3.841 \quad P^* < 0.05$

Our study suggest no significant association between the number of antenatal checkups and PPH among the postnatal women, and between the physical parameters checked during antenatal visit and PPH (**Table 3**). However, there is a significant association between HB% detection at the third trimester and PPH.

**Table 3** Chi square value showing association between number of antenatal visit and PPH (N = 100)

Nature of availing antenatal care	PPH		Total	Chi-square value $\chi^2$
	Present	Absent		
No. of antenatal visit				1.287
<3	1	5	6	
≥3	5	89	94	
Parameter of physical examination completed ( BP,Weight, edema)				0.7971
<3	4	45	49	
≥3	2	49	51	
Hb estimation at third trimester				5.43*
Done	0	46	46	
Not done	6	48	54	

$\chi^2 df(1) = 3.841 \quad P^* < 0.05$

This study establishes a significant association between the obstetrical examination during antenatal period and birth weight of the newborn (**Table 4**).

**Table 4** Association between the obstetrical examination during antenatal checkup and birth weight (N = 92).

Parameter of obstetrical examination (Fundal height, abdominal palpation and girth, fetal heart sound auscultation)	Birth weight		Total	Chi-square value ( $\chi^2$ )
	<2.5 kg	• 2.5 kg		
<3	9	11	20	8.834
3	11	61	72	

$c^2 df(1) = 6.635 \quad P < 0.01$

We found a significant association between the occupation of postnatal women and live birth. Also, total number of antenatal visit by the postnatal women during antenatal period was found to be significantly associated with the live births (**Table 5**).

**Table 5** Chi-square value between antenatal examination and live birth (N = 100).

Characteristics of antenatal examination	Condition at Birth		Total	Chi-square value ( $\chi^2$ )
	Still birth	Live birth		
Occupation of the postnatal women				39.95**
Laborer	7	7	14	
House wife	1	85	86	
No. of antenatal visit availed				49.21**
<3	5	1	6	
≥3	3	91	94	
Physical examination (Blood pressure, weight, edema)				.183
<3 parameters	5	44	49	
3 parameters	3	48	51	

$c^2 df(1) = 6.635 \quad P^{**} < 0.01$

**DISCUSSION**

Usually for normal pregnancies WHO has recommended four antenatal visits. We observed that the use of antenatal care was 94%, which is comparable to the utilization pattern in Rural Lucknow, where 85.5% of the beneficiaries received at least three antenatal care services.<sup>8</sup> In rural North India also three or more visits to health centre were made by 34.9% of the women.<sup>10</sup> Conversely, in Nigeria only 58% attend antenatal clinic regularly.<sup>9</sup> We found that 92% postnatal women had taken injection tetanus toxoid, which is higher than 77.1% in Sudanese women.<sup>11</sup> Complete physical examination was done for 51% postnatal women during their antenatal check-up, which is quite similar to the rural Karnataka (50%).<sup>10</sup> Also, our result (93%) is in agreement with the result (96.4%) of Matthews et al<sup>10</sup> for intake of iron and folic acid tablet.

Common health problems faced by the women during antenatal period identified in our study are: insomnia, headache, pain in the epigastric region, scanty urination and hyperemesis gravidarum. The earlier studies suggest that majority of women (57.5%) did not report problem during pregnancy, while some (10.9%) reported pain in abdomen, 6.8% suffered from bleeding. It recognized weakness (8.5%), backache (6%), dragging sensation (2%), leakage (1%) and injury (1%) as common health issues.<sup>12</sup>

We found no significant association between the educational level of postnatal women and number of antenatal checkup. However, Singh et al<sup>13</sup> found that women with middle and higher education were two to nearly three times more likely to utilize full antenatal care. This discrimination may be due to active participation of the ASHA (Accredited Social Health Activists) and other health workers, health information socialized through

various media, like, government hoardings, newspaper, radio, and television. Our study suggest a significant association between the number of antenatal visit and live birth, and between antenatal examination and delivery of low birth weight baby, similar to findings of Petrou<sup>14</sup> on association between antenatal visit and adverse perinatal outcomes. Ramy et al<sup>15</sup> reported a highly significant association between the materno-foetal outcome and the adequacy of antenatal care.

## CONCLUSION

We found that despite large number of postnatal women receiving complete physical and obstetrical examination during antenatal visits, and most of them did not received routine blood investigations, urine testing, USG investigation, iron and folic acid supplementation. Our comprehensive analysis identifies some common adverse postnatal outcomes observed among the surveyed women. The analysis reveals significant association between occupation and family income against number of antenatal checkup. Also, frequency of antenatal visit and live birth bears a straight association with complete obstetrical examination and birth weight, Hb estimation and PPH, occupation and birth weight. Interestingly we found no such association of educational level of the postnatal women with the number of antenatal checkup.

**Conflict of interest:** None.

**Ethical clearance:** Taken from Institutional Ethical Committee.

**Authors contribution:** We declare that authors named in this article contributed in this study and any liabilities pertaining to the content of this article will be borne by the authors.

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## ORIGINAL PAPER

# A comparative study of MRI and arthroscopic findings in shoulder pathologies

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## ABSTRACT

**Background:** Correct diagnosis of shoulder pathology is essential to start treatment immediately and avoid complications. MRI is an important imaging tool, however, arthroscopy remains the reference standard in diagnosing shoulder pathologies against which alternative diagnostic modality should be compared. This study seeks to compare to what extent MRI findings are accurate, with arthroscopic findings, as the “gold standard” in shoulder pathologies. **Methods:** This was a prospective study of 22 patients with various shoulder pathologies apart from recent fracture, tumor. Both sexes within age group 18-60 years were included in the study. The patients were first examined clinically, followed by 1.5 tesla MRI scan and finally arthroscopically. The findings of MRI were correlated with diagnostic arthroscopy. Sensitivity, specificity, positive predictive value, negative predictive value of MRI findings was calculated to correlate with arthroscopic findings. **Results:** MRI had a significant statistic correlation ( $P < 0.05$ ) with various lesions of shoulder. **Conclusion:** By analysing the results of this study, we conclude that Magnetic Resonance imaging is accurate, practical, efficient, non-invasive, acceptable diagnostic modality in shoulder pathologies especially in condition like full-thickness supraspinatus tear, impingement syndrome, Hill-Sachs lesion and Bank art's lesion. However, statistically significant correlation was not found in SLAP lesions and subscapular is tear.

**Keywords:** SLAP lesions, Subscapular is tear, Bursoscopy, Diagnosis

## INTRODUCTION

Shoulder joint includes three primary articulations, the glen humeral joint, the acromioclavicular joint and the sternoclavicular joint. The shoulder mobility is at the expense of stability, and the resulting “freedom of movement” of the joint predisposes it to a variety of conditions.<sup>1</sup> Third most common cause of musculoskeletal consultation in primary care.<sup>2</sup> Shoulder problems

tend to present mainly as pain. Any disability or pain in the shoulder affects a person's ability to carry out daily activities and work. Early diagnosis to attain prompt recovery and to avoid chronicity and complications is important.

Shoulder pain is mainly due to (i) referred pain, (ii) systemic illness and (iii) musculoskeletal pain arising from shoulder. Clinical history, physical examination, special tests, imaging modalities (plain X- rays, U/S shoulder, CT- scan, MRI) and diagnostic shoulder arthroscopy are usual diagnostic modalities. MRI is the preferred imaging study. However several lesions continue to provide diagnostic challenge. Arthroscopy of the shoulder is a major modality in the diagnosis and treatment of shoulder pathologies. Diagnostic arthroscopy is the most essential step in treating shoulder pathology.

Arthroscopy is the reference standard in diagnosing shoulder pathologies against which alternative diagnostic modality should be compared. This study seeks to compare to what extent MRI findings are accurate, with arthroscopic findings, as the “gold standard”, in shoulder pathologies.

**Objectives:** The aim of the present study is to compare MRI and Arthroscopic findings in shoulder pathologies and to find out the accuracy of MRI findings as compared to arthroscopy in the diagnosis of shoulder pathologies.

## METHODS

This was a prospective study of 22 patients carried out at our institute in a period of 1 year. Patients aged between 18 to 60 years irrespective of sex or with suspected shoulder pathology and with radiologically diagnosed shoulder pathology were

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included in the study. Patients with musculoskeletal tumours around shoulder joint or with recent fractures around shoulder joint or with psychiatric disease, pregnancy or lactation or with Medical contraindications for surgery/MRI were excluded from the study.

**Surgical Technique:** The basic steps of diagnostic arthroscopy are as Patient positioning in lateral decubitus position, Surface outlining of bony landmarks, making portals, Insertion of scope, Visualizing the intrarticular and extrarticular structures in a systematic manner and Closure.

**Procedure:** The patients were examined under anaesthesia. They were put in lateral decubitus position with 30° posterior tilt of the trunk. The shoulder was abducted to 70° and forward flexed to 20°-30°. Traction was applied with adhesive bandage tied to forearm and fixed with a post (**Fig. 1**).



**Figure 1** Positioning of the patient



**Figure 2** Surface outlining

**Surface Outlining:** Anteriorly, the coracoid process (CP), the acromioclavicular joint (ACJ) and the anterior border of the acromion are located and marked. Laterally, the lateral border of the acromion is palpated and marked, posteriorly and laterally, the poster lateral corner of the acromion is also marked (**Fig. 2**).

**Making Portals:** Posterior portal was made at a point located 2

cm inferiorly and 1cm medially to the poster lateral acromial edge (**Fig. 3**). Arthroscopic cannula with a tapered-tip obturator was inserted through the posterior skin incision and through the muscle until the posterior humeral head was palpated. After the capsule was punctured, the scope was inserted. For anterior portal creation, the tip of the arthroscopy is passed into the anterior triangle between the biceps and the subscapularis tendons. The scope is angled a few degrees superiorly and laterally and held against the anterior capsule. The scope is removed and a taper-tipped guide rod is inserted into the cannula to puncture the anterior capsule and rent the skin. A small stab wound adjacent to the tip of guide rod and anterior portal is created.



**Figure 3** Making portals

**Glenohumeral Joint Evaluation:** The arthroscopic evaluation was performed with the video image oriented so that the glenoid surface horizontal on the lower half of the television monitor. A 15- Point anatomy review was done systematically as mentioned by Snyder.<sup>3</sup> The first 10 points of anatomy are visualized in a sequential manner from the posterior portal. The arthroscopy was changed to anterior portal and remaining 5 points of anatomy were reviewed.

#### 15 POINTS ANATOMY REVIEW

##### Posterior Portal

1. Biceps tendon and superior labrum.
2. Posterior labrum and capsule recess.
3. Inferior axillary recess and inferior capsule insertion.
4. Inferior labrum and glenoid articular surface.
5. Supraspinatus tendon of rotator cuff.
6. Posterior rotator cuff insertion and bare area.
7. Articular surface of the humeral head.
8. Anterior superior labrum, SGHL, MGHL and subscapularis tendon.
9. Anterior inferior labrum.
10. Anterior inferior ligament.

##### Anterior Portal

1. Subscapularis tendon.
2. Posterior rotator cuff.
3. Anterior glenoid labrum.

4. Posterior glenoidlabrum.

5. Anterior surface of the humeral head.

**Sub acromialBursoscopy:** Diagnostic bursoscopy was performed to complete the shoulder arthroscopic evaluations as mentioned by Snyder.<sup>4</sup>

**Post-operative Care:** Padded cotton dressing was applied from mid-clavicle to mid arm for 24-48 hours to give better compression and haemostasis. Postoperatively, patient was given routine IV analgesics and antibiotics for 48 hours. Passive range of motion exercises from second postoperative day onwards.

**Follow-Up Period:** Patients were followed up in the out-patient department on 10<sup>th</sup> day operation and on 3<sup>rd</sup>, 6<sup>th</sup> and 10<sup>th</sup> week. After that every month for 6 months.

**Rehabilitation Protocol:** Phase 1 (1<sup>st</sup> 3 weeks) Active and passive range of motion of exercises and pendulum exercises. Phase 2 (Weeks 3 to 6) Shoulder muscles strengthening exercises and light work allowed with the involved shoulder. Phase 3 (Weeks 6 onwards) Normal works allowed.

**Statistical Analysis:** Fisher exact test has been used to find the significance of study parameters on categorical scale between two or more groups. Diagnostic statistics viz. sensitivity, Specificity, PPV and NPV has been calculated.

## RESULTS

An MRI finding was compared with diagnostic arthroscopic findings. The data was analyzed to calculate true positive, true negative, false positive and false negative. Using these specificity and sensitivity, positive and negative predictive values were calculated. Arthroscopic examination was taken as the gold standard for comparison.

**Table 2** MRI Correlation with Arthroscopy of various shoulder pathology

Shoulder pathology	Sensitivity	Specificity	Positive predictive value (ppv)	Negative predictive value (npv)	P value
Impingement syndrome	85.7%	100%	100%	93.7%	<0.0001
Partial tear of supraspinatus	92.3%	88.9%	92.3%	88.9%	<0.0002
Full thickness tear of supraspinatus	100%	100%	100%	100%	<0.0001
Partial thickness subscapular is tear	66.7%	89.5%	50%	94.4%	<0.0727
Bankart's lesion	100%	85.7%	80%	100%	0.0001
Hill-sachs lesion	100%	100%	100%	100%	<0.0001
Slap lesions	40%	94.1%	66.7%	84.2%	<0.1169
Adhesive capsulitis	75%	100%	100%	94.7%	<0.0026

## DISCUSSION

Parsons et al<sup>5</sup> determined the highest prevalence of shoulder pain (17%) in the middle-age group from 45–64 years of age. But in our study we found 21-30 years age group as the most prevalent age group of shoulder pain (50%). This may be due to the fact that this age group is involved more with sports activities and is a sizeable working population. Moreover, most of the patients participating in our study belonged to this age group.

Shoulder pathology was involved in 60% males and 40% females in a study by Halma et al.<sup>6</sup> In our study, shoulder pathology was

The age ranged from 18-54 years with a mean age of 29.5 years in our study. Maximum incidence of shoulder pain and/or instability was found in 21-30 years of age group. Out of 22 patients, 18(81.8%) patients were male and 4(18.2%) were females in our study. Right shoulder joint was involved in 17(77.3%) patients and left side was involved in 5(22.7%) patients. Dominant hand was involved in 15(68.2%) cases and non-dominant hand was involved in 7(31.8%) cases. In 13 patients where features of shoulder instability were found in arthroscopy, 12(92.3%) patients had a history of trauma preceding symptoms whereas in 1(7.7%) patient there was no such history. All the patients presenting with features of shoulder instability were of anterior type. The mean duration between MRI and arthroscopy was 3.6 weeks.

Out of twenty two cases, MRI diagnosed impingement syndrome in six patients, partial thickness supraspinatus tear in thirteen patients, full-thickness supraspinatus tear in two patients, partial subscapular is tear in four patients, Bank art's lesion in ten patients, Hill- Sachs lesion in five cases and SLAP lesion in three patients and adhesive capsulitis in three cases (**Table 1**).

**Table 1** Distribution of MRI and Arthroscopic Findings

DIAGNOSIS	MRI (No. of cases)	ARTHROSCOPY (No. of cases)
Impingement syndrome	6	7
Partial-thickness supraspinatus tear	13	13
Full-thickness supraspinatus tear	2	2
Partial thickness subscapular is tear	4	3
Bankarts lesion	10	8
Hill-sachs lesion	5	5
Slap	3	5
Adhesive capsulitis	3	4

present in 81.8% males and 18.2% females. This may be due to the low attendance of female patients having shoulder problems in our institution during the period of study. Rowe<sup>7</sup> stated that 96% were traumatic in origin and only 4% were a traumatic. In our study, out of 13 patients having features of instability, 12(92.3%) patients had a history of trauma preceding symptoms whereas in 1(7.7%) patient, there was no such history. According to Rowe,<sup>8</sup> majority of the patients present with traumatic anterior instability and 95% of shoulder dislocations are of the anterior type. In our study 100% of patients having features of instability



were of anterior instability. In a study by Iannotti et al<sup>9</sup> and other similar study by A M Malhi, R Khan,<sup>10</sup> found sensitivity ranging from 84% to 93% and specificity ranging from 76% to 87% for impingement syndrome, which are comparable to our study. In a systematic study by Smith et al<sup>11</sup> and other similar studies,<sup>12, 13, 14</sup> the pooled sensitivity values ranged from 44% to 98% and specificity values ranged from were 90% to 95%, which are comparable to our study for partial-thickness supraspinatus tear. In a study by Troughed et al<sup>15</sup> and other similar studies,<sup>16, 17, 18</sup> MRI sensitivity ranged from 89% to 100% and specificity ranged from 95% to 100% for full thickness supraspinatus tear, which are comparable to our study. In a retrospective study comparing magnetic resonance imaging and arthroscopic findings by Guido<sup>19</sup> et al, MRI sensitivity and specificity were respectively 25% and 98% for subscapular is tendon tears, which is comparable to our study. Hayes ML, Collins MS et al<sup>20</sup> found that the sensitivity of MRI in detecting Bank art's lesion was 98.4% and specificity was 95.2%. For Hill-Sachs lesion, sensitivity of MRI was 96.3% and specificity was 90.6%. These are comparable to our study. In 2008, Kautzner et al,<sup>21</sup> found MRI sensitivity of 43 % and specificity of 96 % for SLAP lesions. We found comparable results of 40% sensitivity and 94.1% specificity in our study. Jung et al,<sup>22</sup> found sensitivity and specificity of 79% and 100% respectively of MRI for adhesive capsulitis. In our study, we found sensitivity of 75% and specificity of 100% of MRI, which is comparable. Berjano et al<sup>23</sup> reported on 179 shoulder arthroscopic procedures noting an overall complication rate of 9.49%. In our study, out of 22 cases, 2 cases developed complications. One was bleeding during bursoscopy and debridement during intraoperative period for which radiofrequency ablation was done to control bleeding and other developed haemarthrosis which resolved spontaneously. Overall, complication rate in our study was 9.1% which is comparable to previous mentioned literature.

## CONCLUSION

Magnetic Resonance imaging is accurate, practical, efficient, non-invasive, acceptable diagnostic modality in shoulder pathologies especially in condition like full-thickness supraspinatus tear, impingement syndrome, Hill-Sachs lesion and Bank art's lesion. However, for SLAP lesions and partial tear subscapular is tendon we could not find statistically significant correlation between MRI and arthroscopy. Hence, a larger study is recommended for a conclusion to be made. Continued interaction and collaboration between a Radiologist and Shoulder arthroscopic surgeon may lead to a better understanding of the pathologies and may help in defining required modification and innovation in MRI technique for improved accuracy of MRI in diagnosing shoulder pathologies.

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## ORIGINAL PAPER

# A study of effect of storage condition on blood alcohol concentration in living subjects

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### ABSTRACT

**Introduction:** Many studies have demonstrated that both generation and loss of alcohol in stored blood samples. Studies have concluded that both high temperature and an insufficient enzyme inhibitor concentration can result in alcohol generation, presumably as a result of bacterial fermentation. Factors most affecting the stored blood samples, to be used for ethanol determination were the duration and temperature of storage and concentration of preservative. **Objectives:** To determine whether alcohol is generated or lost in blood samples stored at different periods and with the presence or absence of preservative and refrigeration. **Methods:** 40 adult males of drunkenness were selected as subjects for estimation of blood alcohol. Then after taking written informed consent 30ml of blood is collected from the each individuals. 5 samples were preserved in sodium fluoride vacutainer and refrigerated at 4°C. Another 5 samples were preserved in plain vacutainer and kept at room temperature. Then these were subjected to estimation of blood alcohol concentration (BAC) by Gas Chromatography-Flame Ionization Detector (GC-FID) at various interval of time i.e., on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 30<sup>th</sup> and 60<sup>th</sup> day. **Conclusion:** BAC in samples without preservative and without refrigeration has fallen significantly as storage period increases at each point of time compared to BAC with preservative NaF (Sodium Fluoride) and with refrigeration at 4°C. NaF and refrigeration of samples at 4°C significantly prevents loss of BAC in stored samples.

**Keywords:** Blood Alcohol Concentration; Sodium Fluoride

### INTRODUCTION

The accurate determination of alcohol concentration levels in human blood samples is important for valid results in research studies and often has critical medical and legal ramifications in forensic and toxicological reports.<sup>1</sup> Many studies have demonstrated that both generation and loss of alcohol in stored blood samples. Studies have concluded that both high temperature and an insufficient enzyme inhibitor concentration can result in alcohol generation, presumably as a result of

bacterial fermentation.<sup>2</sup> Factors most affecting the stored blood samples, to be used for ethanol determination were the duration and temperature of storage and concentration of preservative.<sup>3</sup> Ethanol losses in samples are positively correlated with the length of storage and the original ethanol concentration in the blood.<sup>4</sup> Antemortem blood samples stored at room temperature or higher will cause a decrease in BAC, not an increase.<sup>5</sup>

Post-mortem production of ethanol up to 70 mg% till 7<sup>th</sup> day and in few cases even up to 14<sup>th</sup> day. After 14<sup>th</sup> day there is loss of ethanol that further decreased on 28<sup>th</sup> day to become alcohol free.<sup>6</sup> Majority of cases showed higher number of BAC till 20 days thereafter from 21 days to 30 days they found subsequent decrease in BAC.<sup>7</sup> The possibility of in vitro synthesis of ethanol in samples has been raised, as well as loss due to evaporation or adsorption of the ethanol onto rubber stopper.<sup>8</sup> Increase in post-mortem ethanol production is due to the presence of bacteria. More than 50 species of bacteria, yeast and fungus were capable of producing post-mortem ethanol.<sup>9</sup> However in some studies freshly collected blood samples have shown that concentrations do not change in preserved samples stored in room temperature for up to two months or refrigerates samples stores up to 10 months.<sup>10</sup>

### OBJECTIVE

To determine whether alcohol is generated or lost in blood samples stored at different periods and with the presence or absence of preservative and refrigeration.

### METHODOLOGY

40 adult males who were brought by the police to the emergency

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department for drunkenness examination were selected as subjects for estimation of blood alcohol. Then after taking written informed consent 30ml of blood is collected from the individuals who have consumed alcohol 2 hours prior. Then the collected 30ml blood sample was equally divided into 10 parts of 3ml each, out of which 5 samples were preserved in sodium fluoride vacutainer which contained 3mg NaF per ml of blood. Samples were well mixed and refrigerated at 4°C. Another 5 parts are preserved in plain vacutainer and kept at room temperature. Then these were subjected to estimation of blood alcohol concentration (BAC) by Gas Chromatography-Flame Ionization Detector (GC-

FID) at various interval of time i.e., on 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 30<sup>th</sup> and 60<sup>th</sup> day. Institutional Ethical committee clearance was obtained prior to conducting this study.

## RESULTS

Tables 1 depicts BAC with preservative and with refrigeration and BAC without preservative and without refrigeration (comparison of mean differences of BAC in two groups at individual points of time) shows significant changes i.e., BAC in samples without preservative and without refrigeration had fallen significantly as storage period increases at each point of time compared to BAC with preservative and with refrigeration.

**Table 1** Comparison of mean differences of BAC in two groups at individual points of time

BAC at end of	Group	Number of samples	Mean BAC	P value
2 <sup>nd</sup> Day	With Preservative and with Refrigeration	40	57.21	0.001
	Without Preservative and Without Refrigeration	40	47.09	
	Total	80		
7 <sup>th</sup> Day	With Preservative and with Refrigeration	40	51.45	0.0003
	Without Preservative and Without Refrigeration	40	42.50	
	Total	80		
14 <sup>th</sup> Day	With Preservative and with Refrigeration	40	55.84	0.0089
	Without Preservative and Without Refrigeration	40	49.20	
	Total	80		
30 <sup>th</sup> Day	With Preservative and with Refrigeration	40	49.20	0.0168
	Without Preservative and Without Refrigeration	40	44.40	
	Total	80		
60 <sup>th</sup> Day	With Preservative and with Refrigeration	40	41.92	0.0177
	Without Preservative and Without Refrigeration	40	34.68	
	Total	80		

Mann-Whitney Test the two-tailed P value is considered significant.

**Table 2** depicts, when BAC samples were analysed within the groups i.e., samples with preservative and with refrigeration, we found that BAC had fallen significantly as storage time increased in this group.

**Table 2** BAC (in mg %) level with Preservative and with Refrigeration at 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 30<sup>th</sup> and 60<sup>th</sup> day

BAC at end of	Mean Rank
2 <sup>nd</sup> at end of	4.08
7 <sup>th</sup> Day	2.78
14 <sup>th</sup> Day	3.95
30 <sup>th</sup> Day	2.80
60 <sup>th</sup> Day	1.40

Chi Square 75.34, Degree Freedom 4

**Friedman Test:** The P value is < 0.0001, considered extremely significant.

**Table 4** depicts, Mean BAC in samples with preservative and with refrigeration, in which Mean BAC had fallen gradually as storage period increased except on the 14<sup>th</sup> day where Mean BAC increased and then fell gradually.

**Table 3** depicts, when BAC samples were analysed within the groups i.e. samples without preservative and without refrigeration, we found that BAC had fallen significantly as storage time increased in this group.

**Table 3** BAC (in mg %) level without Preservative & without Refrigeration at 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 30<sup>th</sup> and 60<sup>th</sup> day

BAC at end of	Mean Rank
2 <sup>nd</sup> at end of	3.50
7 <sup>th</sup> Day	2.70
14 <sup>th</sup> Day	4.00
30 <sup>th</sup> Day	3.08
60 <sup>th</sup> Day	1.73

Chi Square 47.54, Degree Freedom 4

**Friedman Test:** The P value is < 0.0001, considered extremely significant.

**And** Mean BAC in samples without preservative and without refrigeration in which Mean BAC has fallen gradually as storage period increased except on 14<sup>th</sup> day where Mean BAC had increased and then fell gradually.

**Table 4** Mean BAC (in mg %) level with Preservative & with Refrigeration v/s Mean BAC (in mg %) level without Preservative & without Refrigeration

Days	Mean BAC in Sample with Preservative & with Refrigeration	SD in Sampe with Preservative & with Refrigeration	Mean BAC in Sample without Preservative & without Refrigeration	SD in Sampe without Preservative & with Refrigeration
<b>2<sup>nd</sup> Day</b>	57.21	11.47	47.09	11.08
<b>7<sup>th</sup> Day</b>	51.45	12.13	42.50	6.35
<b>14<sup>th</sup> Day</b>	55.84	9.26	49.20	11.03
<b>30<sup>th</sup> Day</b>	49.20	13.08	44.40	10.74
<b>60<sup>th</sup> Day</b>	41.92	10.72	34.68	14.75

## DISCUSSION

### **BAC at 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 30<sup>th</sup> and 60<sup>th</sup> day in Samples with preservative and with refrigeration v/s Samples without preservative and without refrigeration**

BAC with preservative and with refrigeration and BAC without preservative and without refrigeration which shows significant changes i.e., BAC in samples without preservative and without refrigeration have fallen significantly as storage period increases at each point of time compared to BAC with preservative and with refrigeration.

The highlight of our study is use preservative NaF & refrigeration of samples at 4°C for analysing BAC in which fall of BAC is significantly less than those samples without preservative and without refrigeration.

Lewis RJ et al.<sup>11</sup> concluded that NaF and refrigeration is preferred way of storage for estimation of blood alcohol concentration of the blood samples.

In the study conducted by dubowskietal.<sup>12</sup> the samples which were analysed without preservative and without refrigeration showed a decrease in the BAC and when they studied the samples with preservative (NaF and biocide sodium aside) and with refrigeration there was no significant change in BAC. So also Brown et al.<sup>3</sup> in his study concluded that factors most affecting the stored blood samples were duration, temperature of storage and concentration of preservative. Similarly Wigmore JG<sup>5</sup> in his study concluded that the most accurate determination of BAC is from the blood samples which are refrigerated and Ma Dong<sup>13</sup> concluded the best condition for keeping ethanol stable in blood is refrigeration with preservative and with 50% of air chamber in container. Also the results of Slavka et al.<sup>14</sup> showed that alcohol concentrations were significantly reduced with the increase of temperature and prolongation of storage. Room temperature storage of samples is the least suitable way of keeping them, independent of the duration of storage. The temperature of storage, duration of storage, selection of preservatives and air quantity above the sample are said to be the most common causes of changes in the value of ethanol in whole blood samples. There is the synergism of these influences and it is hard to discuss the conditions separately. Wichai Wong chanapai<sup>15</sup> concluded that the concentrations of ethanol in bloods with 1% sodium fluoride as preservative stored at 4°C were more stable than at -20°C and room temperature.

### **BAC at 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 30<sup>th</sup> and 60<sup>th</sup> day in Samples with preservative and with refrigeration**

When BAC samples analysed within groups i.e., samples with preservative and with refrigeration, we found that BAC has fallen significantly as storage time increased in this group.

### **AND BAC at 2<sup>nd</sup>, 7<sup>th</sup>, 14<sup>th</sup>, 30<sup>th</sup> and 60<sup>th</sup> day in Samples without preservative and without refrigeration**

When BAC samples analysed within groups i.e. samples without preservative and without refrigeration, we found that BAC has fallen significantly as storage time increased in this group.

BAC in above mentioned both groups i.e. samples with preservative NaF and with refrigeration at 4°C and samples without preservative and without refrigeration has significantly fallen gradually as storage period increased.

Reason for loss of BAC in above mentioned both groups can be attributed to the chemical oxidation of the stored samples as well as due to the evaporation and adsorption.

Jones AW<sup>16</sup> showed that ethanol losses in samples are positively correlated with the length of storage and the original ethanol concentration in the blood. Moynham et al.<sup>17</sup> found that in blood taken from living subjects, there was no alcohol generation regardless of varying storage temperatures, times and the presence or absence of an enzyme inhibitor, but there was some alcohol depletion after longer storage times. Shan X et al.<sup>18</sup> found that alcohol positive cases showed various changes in BAC ranging from no significant change to a 47% decrease and concluded long term storage either under refrigeration, at or above room temperature decreased BAC. Tracey Winek<sup>19</sup> inferred that whole blood samples stored for 35 days at 26.7°C to 37.8°C lost alcohol and the percentage loss of BAC averaged between 10-19%. And important mechanism with regard to stability of alcohol in stored blood was a strongly temperature dependent alcohol oxidation reaction which was not inhibited by sodium fluoride. Aybel AJ.<sup>20</sup> showed blood samples without preservative stored under refrigeration (3°C) for 18 months to 2 years, showed decrease in ethanol content. The decrease were attributed to oxidation and (or) evaporation. Slavka Mandic-Radic<sup>14</sup> showed that alcohol concentrations were significantly reduced with the increase of temperature and prolongation of storage. Wichai Wong chanapai<sup>15</sup> concluded that the loss of ethanol in stored whole blood sample was due to the chemical oxidation rather than the physical loss. Anderson SG et al.<sup>2</sup> found that consistently



higher rates of alcohol depletion in the preserved samples might reflect salting-out effect and/or some reaction alcohol and sodium fluoride. Dubowski et al.<sup>12</sup> showed that ethanol levels in whole blood samples stored up to 1 year (refrigerated at 4°C) without preservative declined slightly (less than 5%), but this decrease was not statistically significant. Samples stored with the preservative and biocide sodium aside did not show any ethanol degradation over the 12-month storage period. Glendenning BL and Waugh TC<sup>10</sup> concluded freshly collected blood samples have shown that concentrations do not change in preserved samples stored in room temperature for up to two months or refrigerated samples stores up to 10 months. Charies L et al.<sup>8</sup> concluded in their study that Alcohol analyses of blood obtained aseptically from living humans can be delayed for as long as 14 days without a significant change in alcohol content. This hold true whether the blood sample is refrigerated or not, or whether a preservative is added to sample or not.

#### **Mean BAC in with preservative and with refrigerated samples v/s Mean BAC in without preservative and without refrigeration samples**

Mean BAC in samples with preservative and with refrigeration, in which Mean BAC has fallen gradually as storage period increased except on the 14<sup>th</sup> day where Mean BAC is increased and then fell gradually.

Mean BAC in samples without preservative and without refrigeration in which Mean BAC has fallen gradually as storage period increased except on 14<sup>th</sup> day where Mean BAC has increased and then fell gradually.

In above mentioned both groups mean increase in BAC at 14<sup>th</sup> day could be attributed to microbial fermentation due to contamination.

C B Jani et al.<sup>7</sup> concluded that majority of cases showed higher number of BAC till 20 days thereafter from 21 days to 30 days they found subsequent decrease in BAC in antemortem sample. Avbel AJ<sup>20</sup> studied post-mortem human blood samples without preservative stored under refrigeration (3°C) for 18 months to 2 years, observing increase and decrease in ethanol content. The decrease were attributed to oxidation and (or) evaporation, the increases to post-mortem synthesis of ethanol by microbial fermentation of glucose. Anderson SG et al.<sup>2</sup> concluded that both high temperature and an insufficient enzyme inhibitor concentration can result in alcohol generation, presumably as a result of bacterial fermentation. Stojan Pet kovic et al.<sup>21</sup> confirmed that the absences of preservative and prolonged storage at higher temperatures are not necessarily sufficient for alcohol production in antemortem blood samples. Singh and Chandra<sup>6</sup> have reported that on 14<sup>th</sup> day of analysis there is post-mortem loss of ethanol that further decreased on 28day to that maximum to become alcohol free. However they also reported that maximum production of ethanol occur as 70mg % mostly within 7<sup>th</sup> day.

Usually the samples for BAC estimation which were stored without preservative at room temperature were analysed after longer duration (approximately 1 to 2 months), which lead to significant loss of BAC as the storage period increased. We recommend that samples for BAC estimation should be ideally preserved in sodium fluoride vacationer with refrigeration at 4°C.

#### **CONCLUSION**

Present study concludes BAC in samples without preservative

and without refrigeration has fallen significantly as storage period increases at each point of time compared to BAC with preservative NaF and with refrigeration at 4°C. NaF and refrigeration of samples at 4°C significantly prevents loss of BAC in stored samples.

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## CASE REPORT

# Mercury poisoning with acute kidney injury

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### ABSTRACT

*Exposure to inorganic mercury or mercuric salt can occur as an occupational hazard or suicidal attempt and can cause vomiting, severe abdominal pain, gastrointestinal bleeding, hypovolemic shock and renal tubular necrosis leading to oliguria or anuria. Hemodialysis is used in severe cases of toxicity when renal function has declined. This report aims at highlighting the clinical presentation and course of a case of mercuric poisoning who was treated with hemodialysis. This article reports a case of mercury poisoning whose renal failure improved with high flux hemodialysis. A 25 years old girl ingested a heavy metal compound containing Mercuric chloride obtained from her place of work in a deliberate suicidal attempt, following which she developed massive hematemesis, hypotension and developed renal failure with anuria. She was treated with broad spectrum antibiotics, IV pantoprazole and high flux hemodialysis. Renal biopsy was suggestive of acute tubular necrosis. After 7 hemodialysis her urine output began to improve and dialysis was stopped. Her renal function gradually improved and her blood mercury level also decreased. We have here by presented a case of mercury intoxication with acute tubular necrosis in a 25-year old woman, with an excellent improvement of the renal failure and normalization of laboratory results with high flux hemodialysis.*

**Key words:** *high flux dialysis, renal biopsy, acute tubular necrosis*

### INTRODUCTION

Acute poisoning with mercuric salts (typically  $\text{HgCl}_2$ ) generally targets the gastrointestinal tract and the kidneys. Extensive precipitation of enterocyte proteins occurs, with abdominal pain, vomiting, and bloody diarrhoea with potential necrosis of the gut mucosa. This may produce death either from peritonitis or from septic or hypovolemic shock. Surviving patients commonly develop renal tubular necrosis with anuria.<sup>1</sup> Historically, mercuric chloride ( $\text{HgCl}_2$ ) was used as a preservative and for development

of photographic film and was ingested accidentally or as a suicide measure. It is a component of some skin-lightening creams. Only about 2% of ingested mercuric chloride is absorbed initially,<sup>2</sup> although it is believed that its corrosive effect on the intestine may increase permeability and hence, absorption, with prolonged exposure.<sup>3</sup> Much of the body burden of mercuric mercury resides in the proximal convoluted renal tubule<sup>4</sup> bonded to metallothionein.<sup>5</sup> Significant deposition also occurs periportal in the liver<sup>6</sup> and lesser amounts in epithelial tissues, choroidal plexus, and testes. Excretion of mercuric mercury is largely through urine and stool, although significant amounts are shed through sweat, tears, breast milk, and saliva.<sup>7</sup> Half-lives appear to be multiphasic, as with metallic mercury, with human studies suggesting an effective half-life of 42 days for 80% of an oral tracer dose.

Previous reports on the use of extracorporeal procedures such as haemodialysis and haemoperfusion have shown no significant removal of mercury. One case report showed the successful use of the chelating agent 2,3-dimercaptopropane-1-sulphonate (DMPS), together with continuous veno-venous haemodiafiltration (CVVHDF), in a patient with severe inorganic mercury poisoning.<sup>8</sup> Another case report showed the effectiveness of plasma exchange with dimercaprol chelation in normalizing the renal function in acute mercuric chloride poisoning.<sup>9</sup> We present here a case of mercuric chloride poisoning where renal failure was successfully treated with high flux hemodialysis.

### CASE REPORT

A 25 years old girl ingested a heavy metal compound containing

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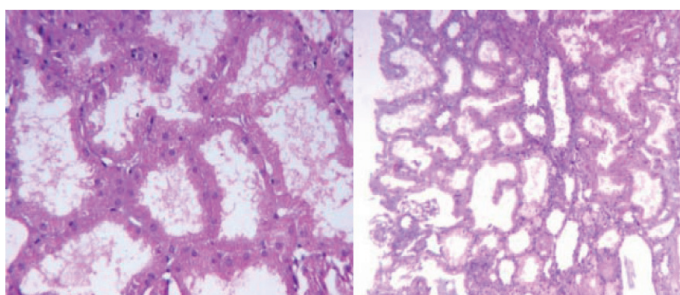
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Mercuric chloride obtained from her place of work in a deliberate suicidal attempt. 1 hour following ingestion she was taken by her colleagues to a nearby Railway Hospital with complaints of burning pain in the abdomen and burning sensation in the throat. Immediately gastric lavage was done and patient was managed conservatively with intravenous fluids and proton pump inhibitors. Patient did not have any other significant medical history and the patient was not on any regular medication.

Two hours following ingestion she had vomiting followed by a large hematemesis for which she received 2 units of blood transfusion. When the patient continued to have hematemesis despite all conservative measures, she was referred to a higher centre for further management.

On presentation to the emergency department of the Tertiary Care Hospital 4<sup>1/2</sup> hours after ingestion of the mercuric compound she was afebrile, fully conscious but irritable. Her heart rate was 150 beats per minute, respiratory rate 32 breaths per minute and blood pressure was 96/68 mm of Hg. There was no cyanosis or pallor. Initial investigations showed TC- 13512/mm<sup>3</sup>, Hb- 9.6g/dl, Platelet count- 139000/mm<sup>3</sup>, RBS – 104mg/dl, urea- 44mg/dl, Creatinine- 1.6mg/dl, AST- 212U/l, ALT- 243U/l, ALKP- 360U/l, total bilirubin-1.2mg/dl, total protein 7.2 gm%, albumin 3.7 gm/dl, globulin 3.5 gm/dl and PT- 20.9 sec with an INR of 1.6. Her ECG was normal except sinus tachycardia and radiology including X-ray chest and soft tissue neck was normal. The initial blood mercury level by ICPMS was 35 µgm/dl (N=<1µgm/dl) and urinary mercury levels were 24 µgm/dl (N=<10 µgm/dl).

She continued to have hematemesis and 1 day following ingestion she gradually became drowsy with hypotension and decreasing urine output. She was commenced on broad spectrum antibiotics, intravenous pantoprazole (40 mg twice daily) and nasogastric sucralfate (onegm three times daily) and had no further gastrointestinal bleeding. By the third day she was completely anuric and was put on inotropic support. Her serum creatinine increased from 1.6mg/dl on the first day to 5.0mg/dl by the third day. She received 6 units of FFP and 4 units of blood transfusion. On Day 4 when the patient was hemodynamically stable and there was no further episode of hematemesis, high flux bicarbonate hemodialysis was initiated and continued every alternate day for 14 days. Renal biopsy was done at this time, which was suggestive of acute tubular necrosis (**Figure 1**). After 7 sessions of hemodialysis her urine output started to increase and gradually her creatinine levels started to fall till it reached 1.2mg/dl 7 days there after without any further sessions of hemodialysis. Her blood mercury level on the 25<sup>th</sup> day post ingestion was 5 µgm/dl.



**Figure 1** Renal biopsy showing acute tubular necrosis

She was transfused 15 U bloods over the first 20 days. Her blood parameters on Day 25 showed normal renal function, mildly deranged liver function with leucocytosis. However on the 26<sup>th</sup> day she again had a large bout of hematemesis and despite all conservative measures she succumbed to her GI bleed.

## DISCUSSION

The clinical picture of acute mercury poisoning in our patient was characteristic. It includes sudden, profound circulatory collapse with tachycardia, hypotension and peripheral vasoconstriction and vomiting. Renal failure usually develops within 24 hours and is associated with albuminuria, epithelial cell casts and red cells in the urine, glycosuria, and aminoaciduria. Oliguria may proceed to complete anuric failure. There is a neutrophil leucocytosis of up to  $20 \times 10^6/L$  due to tissue necrosis. Histologically the classic renal lesion of acute mercury poisoning lies in the terminal part of the proximal tubule. Mercury ions are probably specifically concentrated there and have a direct toxic effect on the cell membrane. In fatal cases the tubular epithelial cells show a spectrum of degeneration, fragmentation and necrosis with areas of bare basement membrane. The tubular lumen is blocked by large casts and granular debris. There is variable interstitial oedema but no consistent vascular or glomerular changes. Mercury is also widely taken up by body tissues, so that in fatal cases other organs may show non-specific changes, viz., colitis, liver necrosis and cerebral petechial haemorrhages. Death in our patient was attributed not to renal failure, for which appropriate and adequate treatment was instituted, but to massive hematemesis and consequent cardiovascular collapse. Rate of excretion of inorganic mercury is complex, which occurs in three phases: 35% of single dose is excreted within few days, a second phase with half-life of 30 days account for 50%, and rest is excreted in slow third phase with a half-life of 100 days.<sup>10</sup> Renal failure due to acute tubular necrosis usually becomes evident within few hours, but in our case it occurred after 2 days. In severe cases, death may occur due to cardiovascular collapse. Because of its solubility, mercuric chloride is the most toxic of the inorganic salts with a mean lethal dose in the adult 0.2–1.0 gm. Acute mercury poisoning is best managed by discontinuing the exposure, providing supportive therapy and enhancing the removal of the metal from the body. Elimination of mercury from the body is achieved by chelation therapy and self-excretion. Hemodialysis, haemoperfusion and peritoneal dialysis have been reported to have little efficacy or to be completely ineffective in removing mercury.<sup>9</sup> Historically, the appropriate treatment for acute inorganic mercury poisoning is chelation therapy using dimercaprol (BAL), if renal failure develops, dialysis may be needed.<sup>9, 10</sup> One case report showed a 26 years old woman treated by plasma exchange, hemodialysis and peritoneal dialysis in combination with continued dimercaprol chelation. Dimercaprol mobilizes tissue mercury by forming soluble complexes, which are excreted in urine. While hemodialysis was ineffective in removing the mercury, plasma exchange effectively eliminated mercury. After two plasma exchange therapies, mercury concentration in the blood decreased linearly on a log scale with half-lives of 23.1 days for whole blood and 19.1 days for plasma, using first-order kinetics. One



month after ingestion, renal function recovered to normal as judged by serum creatinine and blood urea nitrogen levels, at a follow-up examination four months later, renal function was found to be completely normal. This indicates that the renal damage caused by acute mercuric chloride poisoning may not be permanent. In our case on the contrary High flux hemodialysis was found to be highly effective in treating the renal failure of mercury chloride poisoning.

## CONCLUSION

We have hereby presented a case of mercury intoxication with acute tubular necrosis in a 25-year old woman, with an excellent improvement of the renal failure and normalization of laboratory results with high flux hemodialysis.

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**Ethical clearance:** Taken.

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## CASE REPORT

# Esthetic rehabilitation of fluorosis affected teeth

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### ABSTRACT

*This article describes an esthetic rehabilitation of a case of severe fluorosis. Dental fluorosis is caused by an excessive fluoride intake during tooth formation. Fluoride-related alterations in enamel lead to surface hyper mineralization and subsurface hypo mineralization which are characterized by white opaque appearance with secondary brown stain. Esthetic rehabilitation of fluorosis affected teeth. Direct composite technique was applied to improve the color, shape and alignment of the teeth using direct composite veneering. Esthetically pleasing result. Long-term clinical trials are needed to evaluate the appropriateness of the various management options for fluorosis of varying severity.*

**Keywords:** Bonding, management, veneer, discoloration

### INTRODUCTION

Dental fluorosis is a specific disturbance due to chronic ingestion of excessive fluoride during the formative period of the dentition.<sup>1</sup> The increased incidence of dental fluorosis in developing countries over the last few decades is considered to be largely due to the wide spread usage of fluoride. Fluoride-containing drinking water is the main potential sources for this developmental tooth disorder in many parts of the world. Drinking water containing excessive amount of fluorine (3 to 5 mg /L), endemic fluorosis has been observed. Endemic fluorosis has been reported in certain parts of India and is an important health issue. Fluoride-related alterations in enamel lead to surface hyper mineralization and subsurface hypo mineralization which are characterized by white opaque appearance with secondary brown stain.<sup>2,3</sup>

The successful treatment of fluorosed teeth is a subject of interest in the literature. An appropriate treatment plan may be selected depending on the severity of the fluorosis.<sup>2,3</sup> In the mild cases of dental fluorosis, clinical appearance is characterized by opaque white areas presenting as horizontal lines and cloudy patches on the enamel surface. Bleaching and microabrasion have been recommended for these forms of fluorosis. In the moderate-to-severe level of fluorosis, all tooth surfaces are affected by white

opacities.<sup>2,3</sup> Brown stains also present in the involved teeth. Some pits and wear area may be observed on the surfaces as a result of damage to the poorly mineralized enamel. Treatments include microabrasion, direct composite restorations or combination of both methods. In some instances, esthetic veneers or crowns may be necessary for some patients.<sup>2,3</sup>

Direct composite veneers allow operator to control and evaluate entire procedure from shade selection to final morphology usually in a single appointment. It is most commonly utilized form of veneering.<sup>4</sup> These are often been heralded as a more conservative alternative to porcelain. With the advent of microhybrid and nanohybrid composites, finishing and polishing of these restorations can rival that of porcelain.<sup>5</sup> Frequently, the management of fluorosis involves resin composite restorations. This article presents the stages of esthetic rehabilitation of a patient with severe fluorosis including direct composite veneering. Constant advancement of resin technology and advent of newer materials have resulted in reduced shrinkage, improved color stability, wear resistance, and biocompatibility.<sup>6-8</sup>

### CASE REPORT-1

A 23 Year old female patient reported to the Department of Conservative Dentistry and Endodontics, Regional Dental College, Guwahati with the chief complaint of poor esthetic smile due to discoloured teeth. The clinical examination and history revealed that the present discoloration was due to fluorosis in cervical and mesial and distal areas of the middle third of the tooth representing as subsurface brown staining and small pits in enamel representing severe fluorosis [fluoride concentration in drinking water; 3ppm] (**Figure 1**). The diagnosis was made based on the Dean's fluorosis index. Due to young age, patient

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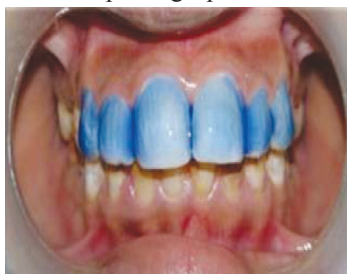
was insisting for esthetic correction of anterior teeth only. Radiographic and clinical examination did not reveal any periapical pathological condition. Therefore esthetic correction with more conservative procedure direct composite for maxillary anterior teeth was planned. The color was recorded using the Vita Classical shade guide. The tooth preparation involved a minimal chamfer in the facial surfaces (**Figure 2**). The enamel surface was acid etched using 35% phosphoric acid gel for 15 sec, rinsed and dried (**Figure 3**). Bonding agent was applied on the prepared enamel and dentin surface and light-cured (**Figure 3**). A stratified layering technique was used to fill the tooth with nanohybrid resin composite. The contouring and finishing was accomplished with finishing burs. The polishing was performed with recommended polishing procedures (**Figure 4**). Patient was recalled in 2 days and encouraged for better dental flossing and also recalled every 6 months for periodical controls.



**Figure 1** Preoperative clinical photograph



**Figure 2** Tooth preparation



**Figure 3** Etching and application of bonding agent



**Figure 4** Postoperative clinical photograph

## CASE REPORT-2

A 21 year old male patient reported to the Department of Conservative Dentistry and Endodontics, Regional Dental College, Guwahati with the chief complaint of poor esthetic smile due to discoloured teeth. The clinical examination and history revealed that the present discoloration was due to severe fluorosis

fluoride concentration in drinking water; 3.2 ppm representing as opaque patches, subsurface brown staining and small pits in enamel representing severe fluorosis (**Figure 5**). The diagnosis was made based on the Dean's fluorosis index. Due to young age, patient was insisting for esthetic correction of anterior teeth only. Radiographic and clinical examination did not reveal any periapical pathological condition. Therefore esthetic correction with more conservative procedure direct composite for both maxillary and mandibular anterior teeth was planned. The color was recorded using the Vita Classical shade guide and the shade A<sub>2</sub> and A<sub>3</sub> was considered as the initial colour. Cotton rolls, salivary ejectors and retraction cords were used for field isolation. The whole procedure was carried out in the same manner as described in the previous case (**Figure 6,7**). Patient was recalled in 2 days and encouraged for better dental flossing and also recalled every 6 months for periodical controls.



**Figure 5** Post-operative clinical photograph



**Figure 6** Clinical photograph of tooth preparation and Etching procedure



**Figure 7** post-operative clinical photographs

## DISCUSSION

In both the above presented cases tooth discoloration was due to increased fluoride content in drinking water. The aim of the treatment in these cases was to restore the patient esthetics and self-esteem. Different treatment plans have been proposed for the treatment of discoloration in the fluorosed teeth depending on the severity of the fluorosis. A direct composite restoration



was a conservative alternative which offered the ability to correct the shape and the contour of maxillary anterior teeth in addition to the removal of discoloration. Direct composite veneers are becoming more popular in repairing defects and to resurface teeth so as to make them appear straight and aesthetically pleasing. It is recommended to grind the fluorosed enamel surface to remove the hyper mineralized layer. Etching with phosphoric acid for 15 seconds achieved the best results in the normal enamel.<sup>11</sup> While the best etching result were obtained at 30 seconds for the moderate fluorosed enamel, increased etching time for severe fluorosis result in less retentive surface.<sup>9</sup> Polishing of direct composite veneers is easy and any cracks or fractures on the restoration may be repaired intraorally.<sup>10</sup> Also, marginal adaptation for composite veneer is better than that of indirect veneer restorations.<sup>11</sup> In these cases, the use of conservative direct composite resins provided both symmetrical and harmonious restoration of the teeth. So in this case we have followed a conservative approach with composite veneering technique to build up an esthetically pleasing smile and restore patient's self-esteem.

## CONCLUSION

Discoloured and pitted enamel of fluorosed teeth may be esthetically objectionable and a cause of psychological and sociological health problems. Hence, therapeutic intervention with minimally invasive procedure is often needed to correct cosmetic defects due to dental fluorosis and several management strategies have been proposed for treating teeth with fluorosis of varying severity.

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## CASE REPORT

# "Say no to surgery"-nonsurgical management of periapical lesions

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*Received on July 18, 2017; editorial approval on August 18, 2017*

### ABSTRACT

*Periapical lesions develop as sequelae to pulp disease. It is accepted that all periapical lesions should be initially treated with conservative nonsurgical procedures. It is a general belief that large periapical lesions will not heal by nonsurgical endodontic treatment and needs surgical intervention. Nonsurgical or conservative management of large periapical lesions. Endodontic treatment with the placement of calcium hydroxide as intracanal medicament. Enhanced healing of the periapical lesions with successful resolution of signs and symptoms both clinically and radiographically. Non surgical endodontic treatment performed with adequate cleaning and shaping, irrigation, canal disinfection and judicious use of intracanal medicament can result in the regression of large periapical lesions.*

**Keywords:** *Healing, radiolucency, calcium hydroxide, endodontic treatment*

### INTRODUCTION

Bacterial infection of the dental pulp may lead to periapical lesions.<sup>1</sup> Periapical radiolucency is the most pronounced clinical hallmark of these lesions.<sup>2</sup> They are generally diagnosed either during routine dental radiographic examination or following acute pain in a tooth.<sup>3</sup> When endodontic treatment is performed to accepted clinical standards, a success rate of around 90% can be expected.<sup>4</sup> The ultimate goal of endodontic treatment should be to return the involved teeth to a state of health and function.<sup>5</sup> All inflammatory periapical lesions should be initially treated with conservative nonsurgical procedures.<sup>6</sup> Surgical intervention is recommended only after nonsurgical techniques have failed.<sup>7</sup> Besides, surgery has many drawbacks, which limits its use in the management of periapical lesions.<sup>8,9</sup> Various nonsurgical methods have been used in the management of periapical lesions including conservative root canal therapy without adjunctive treatment, passive decompression of the lesion, active non surgical

decompression technique using the Endo-eze vacuum system, needle aspiration of the cystic fluid using a buccal palatal approach, aspiration through the root canal, methods using intra canal calcium hydroxide, lesion sterilization and repair therapy (LSTR) and apexum procedure.<sup>10</sup> A high percentage of 94.4% of complete and partial healing of periapical lesions following nonsurgical endodontic therapy has also been reported.<sup>11</sup> This article presents case reports of non-surgical management of large periapical lesions.

### CASE REPORT 1

A 20-year-old male reported to the Department of Conservative Dentistry and Endodontics, Regional Dental College, Guwahati with a swelling in his left mandibular region. He reported a history of pain in the lower left region 1 month back. He consulted a general dentist, where caries excavation in the left mandibular first molar (tooth 36) was done followed by temporary restoration (**Figure 1**). On intraoral examination, there was a hard swelling of the buccal vestibular cortex in the concerning region covered with normal mucosa. Radiographic analysis indicated the presence of a large periapical radiolucency involving distal and mesial roots along with the furcation area with respect to 36. Root canal treatment of 36 was planned and informed consent was obtained from the patient. Rubber dam was applied and the access cavity was prepared. A haemorrhagic, purulent exudate was found from the distal canal of tooth 36. Working length was determined both electronically and radiographically. Cleaning and shaping was performed with rotary files up to X2 (Protaper Next) along with copious irrigation with 3% sodium hypochlorite. Thereafter, Calcium Hydroxide paste was placed as an intracanal

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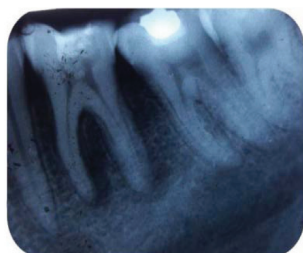
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medicament which was replaced after every 3 weeks for 3 and 6 months (**Figure 2**). When on examination after 6 months resolution of periapical radiolucency was observed. As the teeth showed no pain on percussion, soft tissues were found healthy and the canals were dry, obturation was completed. On examination after 9 months the radiographs showed complete bony healing with well-defined trabecular (**Figure 3**).



**Figure 1** Preoperative radiograph



**Figure 2** Calcium hydroxide placement



**Figure 3** Postoperative radiograph (follow up after 9 months)

## CASE REPORT-2

A male patient 24 years of age, reported to the Department of Conservative Dentistry and Endodontics, Regional Dental College, Guwahati with the chief complaint of swelling and intermittent pain in relation to upper front teeth. A history of accident 2 years back involving trauma to tooth was recorded. There was slight bearable pain since one year and swelling since 2-3 days which has been increasing progressively. On oral examination, a small swelling was seen on the labial aspect with respect to 11 and 12. On radiographic examination, a large radiolucency in the periapical area was seen in relation to 11 and 12 (**Figure 4**). Pulp vitality showed 11 and 12 to be non-vital. Root canal treatment was planned with respect to 11 and 12. Rubber dam was applied and access opening was done. Pus drainage was seen through the root canals. After thorough irrigation, tooth was sealed with a temporary restoration. In the following visit, the working length estimation and a thorough chemo-mechanical preparation were done using Ni-Ti K files. The root canals were irrigated with 3% sodium hypochlorite and the canals were dried with sterile paper points. Later, calcium hydroxide paste was placed in the root canal as intracanal medicament every 3 weeks for 3 months (**Figure 5**). Obturation was then completed with gutta percha using cold lateral condensation technique after ensuring that the canals were dry. Resolution of periapical radiolucency was observed on radiographs at 3, 6, 9 months follow up visits (**Figure 6**).



**Figure 4** Preoperative radiograph



**Figure 5** Calcium hydroxide placement



**Figure 6** Postoperative radiograph (follow up after 9 months)

## DISCUSSION

Management of large periapical lesions has been a subject of debate among various researchers for a long time as the treatment options ranges from non surgical endodontic treatment with long-term  $\text{Ca}(\text{OH})_2$  therapy to various surgical interventions. A thorough instrumentation along with copious irrigation paves the path for a successful root canal treatment. Intracanal medicaments help in disinfecting bacteria contaminated canal. Calcium hydroxide, is a routinely used intracanal medicament and as an interappointment dressing for management of periapical lesions, non-surgically. It is a strong alkaline substance, with a pH of approximately 12.5. In an aqueous solution, calcium hydroxide dissociates into calcium and hydroxyl ions. It is used in various clinical situations such as to promote apexification, to repair perforation, to enhance healing of periapical lesions, to control root resorption, and in the weeping canals. A calcium hydroxide-based paste was used as an antibacterial dressing and to enhance the healing of the periapical lesions in the above mentioned cases. It is suggested that the action of calcium hydroxide beyond the apex may be fourfold: (i) anti-inflammatory activity; (ii) neutralisation of acid products; (iii) activation of the alkaline phosphatase; and (iv) antibacterial action. It has also been reported that treatment with calcium hydroxide resulted in a high frequency of periapical healing, especially in young patients.<sup>12</sup> In the above cases radiographic signs such as density change within the lesion, trabecular reformation and lamina dura



formation confirmed healing, particularly when associated with the clinical finding that the tooth was asymptomatic and the soft tissue was healthy.

### CONCLUSION

Non surgical endodontic treatment performed with adequate cleaning and shaping, irrigation, canal disinfection and judicious use of intracanal medicament can result in the regression of large periapical lesions. However, longer follow up periods are extremely recommended to ascertain that complete healing has taken place.

**Conflict of interest:** None.

**Author declaration:** We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

**Consent from patient:** Taken.

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## CASE REPORT

# Management of temporomandibular joint ankylosis

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### ABSTRACT

Temporomandibular Joint (TMJ) ankylosis is a pathologic condition caused by fusion of the mandible to the mandibular fossa by bony or fibrous tissue. It is extremely disabling as it interferes with mastication, speech, oral hygiene and other day to day activities. It can also be life threatening when struggling to acquire airway in emergencies. In this case report we present 2 cases of TMJ ankylosis, the first Case is of a 10 year old female, where Gap arthroplasty was done to enable normal mouth opening. The second case is Final correction of severe Facial deformity due to TMJ ankylosis in a 24 year old female. **Conclusion:** It is important that TMJ Ankylosis is identified and corrected at an early age so as to prevent complications in future, to create awareness about TMJ disorders and their complete management. TMJ ankylosis normally requires multiple surgeries at different stages so as to obtain optimum results and to let the patient lead a normal life.

**Keywords:** TMJ, Ankylosis, Retrognathia, Gap Arthroplasty, Orthognathic Surgery, Distraction Osteogenesis

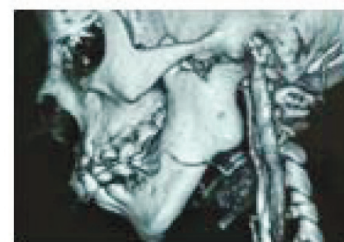
### INTRODUCTION

35% - 90% Temporomandibular Joint (TMJ) ankylosis occurs during first and second decade of life.<sup>1</sup> There are multiple factors that cause TMJ ankylosis, such as trauma, arthritis, infection, previous surgeries, congenital deformities, idiopathic cause.<sup>2</sup> Most common cause is Maxillofacial trauma (13-100%).<sup>3</sup> The management of TMJ ankylosis includes restoration of normal anatomy, form, function, occlusal stability. Aggressive surgical resection of minimum 1.5cm of the ankylotic mass followed by aggressive Physiotherapy.<sup>4</sup> The most common protocol followed is Kaban protocol, which involve wide exposure, aggressive resection (15-20mm), unilateral or bilateral coronoidectomy (if mouth opening is less than 35mm), insertion of temporalis muscle and reconstruction with costochondral graft.

#### Case Report 1

A 10 year old girl presented to our centre with zero mouth opening since the age of 4 years. CT scan revealed complete ankylosis between left mandibular condyle and mandibular fossa leading

to complete obliteration of TM Joint without involving sigmoid notch (**Figure 1**).



**Figure 1** Left TMJ Ankylosis, zero mouth opening

Tracheostomy was performed. The left TMJ was approached via Pre-auricular incision. The ankylosed mass was excised taking care of Internal Maxillary artery which was immediately medial to the ankylosed condyle (**Figure 2**).



**Figure 2** Ankylosed TMJ

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A gap arthroplasty of more the 2cm was performed (**Figure 3**) along with left unilateral coronoidectomy, adequate mouth opening of 30mm was achieved. Patient was reviewed after 3 months. Mouth opening was found to have increased as compared to immediate post op. (**Figure 4**).



**Figure 3** Gap Arthroplasty



**Figure 4** 3 Months Post mouth Opening of 30mm

#### Case Report 2

A 24 year old girl reported to our centre with severe lower facial deformity. She presented with mandibular deviation towards right side. The patient was treated for bilateral TMJ ankylosis in 2014. Patient underwent Orthodontic decomposition for her dental malalignment for a period of one year, which was complicated due to previous non planned extraction of teeth. The lateral Cephalometric and Grummons analysis indicated a mandibular asymmetry of 8mm. The maxilla was in normal position. We performed a differential advancement Bilateral Sagittal Split Osteotomy (BSSO) wherein the mandible was rotated towards left side and advancement Genioplasty (**Figure 5**) to correct her facial asymmetry (**Figure 6**).



**Figure 5** Bilateral Split Sagittal Osteotomy and Genioplasty



**Figure 6** Correction of facial asymmetry

#### DISCUSSION

According to Kaban protocol resection and interposition of temporalis muscle and costochondral grafting should be performed. But in our first case, since the sigmoid notch was not involved, we went ahead with minimal exposure and aggressive gap arthroplasty without interpositional material as suggested by Ahmed et al in their cohort study.<sup>5</sup>

Treatment of TMJ ankylosis presents with significant challenge to a surgeon as there is no consensus on a standard protocol to treat the condition. Primarily there are three treatment modalities: gap arthroplasty, interpositional arthroplasty and articular reconstruction. Another difficulty in the management is various degrees of facial deformity that may arise from TMJ ankylosis.



Moss and Salentijn stated in 1969 that the muscular matrix around the mandible may affect the results of any treatment. Early treatment restores the mandibular mobility and subsequently improves facial growth and remodelling thus reducing the facial asymmetry or Retrognathia.<sup>6</sup>

Facial asymmetry is also a significant complication of TMJ ankylosis. In cases of severe facial asymmetry Distraction Osteogenesis can be performed in order to achieve the desired lengthening of the mandible. In our case there was a facial deviation of 8mm along with chin asymmetry. In cases where less than 10mm discrepancy Bilateral Split Sagittal Osteotomy (BSSO) can be performed to correct mandibular asymmetry. BSSO was first described by Schuchardt, in which three osteotomies were utilized to weaken the bone for later controlled chisel-driven splitting in the sagittal plane.<sup>8</sup> BSSO is a well-established surgical means for the correction of mandibular dysgnathia. Various modifications of the procedure are well-established.<sup>7</sup> The modification of Obwegeser and Dal Pont and the modification of Hunsuck and Epker are the most commonly applied in clinical practice.

The main complication include, Neurovascular damage of the inferior alveolar nerve causing paraesthesia (4.8%-15.2%).<sup>9</sup> Bad split (3%) and infection. It is also important to achieve good dental occlusion for stable results.

## CONCLUSION

TMJ ankylosis requires multidisciplinary approach for holistic treatment and good final outcome. It requires early identification and close cooperation between a maxillofacial surgeon and orthodontist. If proper management is done in early age, these patients can lead a normal life.

**Conflict of interest:** No Conflict of Interest.

**Source of funding:** No source of funding, independent case report.

**Author declaration:** I Dr. Rahul Gogoi, declare that there is no conflict of interest regarding the above case reports.

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## CASE REPORT

# Management of complicated crown root fracture using orthodontic extrusion procedure

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### ABSTRACT

*Complicated crown-root fracture caused by a traumatic injury poses a treatment dilemma for the dentist as these teeth most often require multidisciplinary treatment approach. Management of such injuries can be done by various procedures such as surgical crown lengthening, extraction and orthodontic extrusion. In this case report we have treated a crown-root fracture by endodontic treatment followed by orthodontic extrusion/forced eruption and prosthetic rehabilitation with a crown. The treatment modalities basically include exposing the cervical margin of the tooth followed by appropriate coronal restoration. They all have their own limitations but orthodontic extrusion gives better results as compared to the others.*

**Keywords:** Dental trauma, cervical margin, coronal restoration, forced eruption

### INTRODUCTION

Crown root fracture of the anterior teeth is defined as the fracture involving the enamel, dentin and root cementum with pulp exposure. Management of such cases involve a multi-disciplinary approach including endodontic, crown lengthening and/or orthodontic extrusion followed by prosthetic rehabilitation. Orthodontic extrusion is a conservative procedure that allows retention of a tooth without loss of bone or periodontal support. Orthodontic extrusion or forced eruption was first introduced by Heithersay in 1973<sup>1</sup> and was later supported by Ingber in 1976.<sup>2</sup> The case presented shows the multi-disciplinary approach for the extrusion of a sub-gingival fractured maxillary permanent incisor. A 15 year old male patient reported to the department of Paediatric and Preventive Dentistry with a complaint of missing tooth in the upper right anterior region. The patient gave a history of trauma due to a sports related injury 7 days back. When his tooth was injured, more than 2/3<sup>rd</sup> of the crown structure was lost. On clinical examination, there was no soft tissue injury to be found (Fig. 1). On radiographic

examination, the fracture line was found to be 1 mm subgingivally on the buccal side and at the level of alveolar crest on the palatal side (Fig. 2). There was no damage to the adjacent tooth.



**Figure 1** Pre-op photograph showing fracture in 11



**Figure 2** Pre-op radiographs showing oblique crown-root fracture

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Based on the clinical and radiographic examination, it was diagnosed as complicated oblique crown root fracture.

Vital pulp was found to be present in the root canal and was extirpated with the help of small size files and broaches. Working length was determined, and the canal was cleaned and shaped with intermittent irrigation using sodium hypochlorite and normal saline. The crown-down technique was used to biomechanically prepare the canal. The canal was prepared up to ISO instrument size 30 in the apical region. The root canal was dried with sterile paper points and was obturated with gutta percha and zinc oxide eugenol sealer using the lateral condensation technique. The obturation was assessed with the help of a radiograph.

After obturation of the tooth, post space was prepared by removing the gutta percha from the coronal and middle third of the root canal and an appropriate self-threading metal post was cemented into the root canal space (**Fig. 3**). The placement was also checked in the radiograph.



**Figure 3** Placement of metallic dewel, lingual button and bracket placement

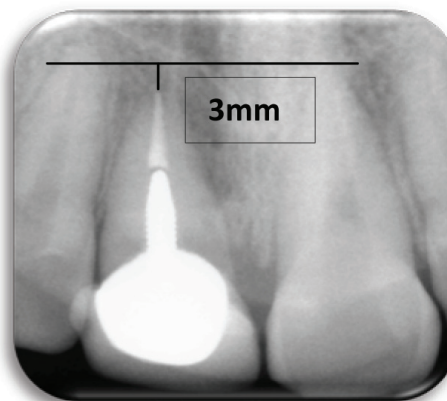
The remaining tooth structure was completely below the gingival margin. This proved to be a hindrance in achieving an adequate ferrule effect for crown placement. For this reason, orthodontic extrusion of the root was planned.

Orthodontic brackets were placed on the anterior teeth with molar bands having molar tubes. A complete periosteal flap was raised for the placement of a lingual button on the buccal surface of the tooth. The lingual button was placed so that a ligature wire could be engaged to it, which would extrude the tooth (**Fig. 3**). A 0.016 Ni-Ti arch wire was placed and the ligature wire was engaged to it. After 4 weeks of activation the amount of tooth movement was evaluated and the root was found to be around 3 mm extruded as seen on the radiograph. Crown-root ratio was 1:1 and was adequate for prosthetic rehabilitation. After a stabilisation period of 4 weeks the arch wire was removed. At this time, it was observed that the gingiva had migrated coronally mostly in the palatal side. For this reason gingivectomy was performed and the patient was recalled after 1 week. On the next visit core build up was done over the threaded metal dowel post using light-cured composite resin and the tooth was prepared for porcelain fused metal crown rehabilitation. Gingival retraction cord was inserted into the gingival sulcus to facilitate recording of the margins in

the margins in the impression. A maxillary arch impression was made in poly vinyl siloxane impression material, while an alginate impression was made for the mandibular arch. The impression was then sent to the lab for crown fabrication. A provisional crown (polycarboxylate crown) was cemented over the prepared tooth until the final restoration was complete. In the subsequent appointments, the final crown was cemented over the prepared tooth using type I luting glass ionomer cement (**Fig. 4, 5**) and occlusion was checked to correct any premature contact. The patient was recalled after 1 year and was found to be asymptomatic.



**Figure 4** Prosthetic rehabilitation with a Porcelain Fused Metal crown



**Figure 5** Post-op radiographs showing the placement of the PFM crown

## DISCUSSION

An oblique crown root fracture with the fracture line lying subgingivally presents a complex case where there is insufficient sound tooth structure for the placement of restorative margins that do not violate the biologic width. Three treatment options are available for such cases: surgical crown lengthening, extraction with subsequent prosthetic replacement, or forced eruption of the involved tooth to expose sound tooth structure.<sup>3</sup>

Surgical crown lengthening is the most commonly applied technique in such cases as it is simple and less time consuming method. But it has many unfavourable consequences like, gingival retraction, possible loss of gingival papilla, clinical crown higher than the adjacent teeth and unfavourable crown-root ratio.<sup>2,4</sup>

Also extractions with prosthetic rehabilitation was not



considered due to the psychological taboo of extraction as presented by the patient.

To avoid this limitation, extrusion by using orthodontic forces was used. Extrusion of a fractured tooth can also be done by surgical methods to re-establish the biological width, expose the fractured sub gingival margins and access the root canal. In this case, orthodontic extrusion was used instead of a surgical extrusion because root resorption is rarely seen and does not involve the loss of periodontal support or bony tissue of the surrounding teeth.<sup>5,6</sup> Also orthodontic extrusion helps to retain a crown-root ratio of approximately 1:1 while undergoing the necessary amount of extrusion. This ratio is favourable in maintaining periodontal support.<sup>7</sup> In this case the crown-root ratio was favourable.

There are many indications for orthodontic extrusion of which the important ones are treatment of a sub-gingival or infraosseous lesion of the tooth between the cement-enamel junction and the coronal third of the root, treatment of trauma or impacted teeth, treatment of a restoration impinging on the biological width, orthodontic extraction where surgical extraction is contraindicated.<sup>8</sup>

Orthodontic extrusion is contraindicated in ankylosis or hypercementosis, vertical root fracture, short roots, which do not allow for adequate support of the restoration (that is, when the crown-root ratio is less than 1:1), insufficient prosthetic space and exposure of the furcation.<sup>8</sup>

In some cases due to use of higher forces there may be pulpal necrosis,<sup>9</sup> but in case of an endodontically treated tooth, it is not a concern.<sup>10</sup> In this case the root was endodontically treated before orthodontic extrusion was applied.

When one tooth has luxated or fractured, the adjacent tooth might have also suffered some injury, hence anchorage of 2-3 healthy teeth should be taken.<sup>11</sup> So in this case bracket placement was done in all the anterior teeth with banding of the molars.

In normal course of events, low-intensity extrusive forces lead to bone and gingival movements. Where as stronger traction forces are exerted as in rapid extrusion, the coronal migration of the tissues supporting the tooth is less pronounced. This is because the rapid movement exceeds the capacity for physiologic adaptation of the supporting tissues.<sup>12</sup> Thus, rapid extrusion is necessary to prevent movement of the gingival collar and alveolar bone with the elevated tooth. One of the main considerations during forced eruption is to have harmony of the esthetic and periodontal health of the tooth. Thus for the esthetic rehabilitation we have used porcelain fused metal crown.

## CONCLUSION

Orthodontic extrusion is a process that helps in preserving the natural tooth and it also maintains the periodontal architecture. Thus it is a conservative procedure. The disadvantages of a fixed bridge, loss of bone or periodontal support, as commonly occurs during extraction can be avoided. The use of orthodontic extrusion is also advantageous over surgical crown lengthening as it does not involve additional resection of supporting bone. Thus, this simple technique can be considered as a saviour for

both the natural tooth and its supporting tissues as it requires a relatively easy movement and helps in subsequent restoration of the tooth.

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